

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of)	
)	
Unlicensed Operation in the Band 3650 – 3700 MHz)	ET Docket No. 04-151
)	
Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band)	ET Docket No. 02-380
)	
Amendment of the Commission’s Rules With Regard to the 3650-3700 MHz Government Transfer Band)	ET Docket No. 98-237
)	

NOTICE OF PROPOSED RULE MAKING

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By the Commission: Chairman Powell issuing a statement.

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I. INTRODUCTION

1. By this Notice of Proposed Rulemaking (Notice), we propose amending our rules to maximize the efficient use of the 3650-3700 MHz band (“3650 MHz band”) and foster the introduction of new and advanced services. In broad terms, the central proposal of this Notice would allow unlicensed devices to operate in either all, or portions of, this radiofrequency (RF) band under flexible technical limitations with smart/cognitive features that should prevent interference to licensed satellite services. Specifically, we propose to allow these devices to operate with higher power than currently authorized under Part 15 of the Rules subject to cognitive technology safeguards. In order to foster the development of the unlicensed use that we propose herein, we also seek comment on whether to restore a uniform primary allocation for all Fixed Satellite Service (FSS) earth stations in the band regardless of the date the earth stations were authorized, and whether to delete the existing co-primary allocations for the Fixed Service (FS) and Mobile Service (MS) in this band. We also seek comment on other options that could also allow for the provision of licensed terrestrial service in this band. On a related matter, we defer action on the petitions for reconsideration of the *First Report and Order (3650 MHz Allocation Report & Order)* in ET Docket No. 98-237 that challenge the Commission’s previous allocation decisions in the 3650-3700 MHz band pending adoption of final rules regarding the allocation changes proposed in this proceeding.¹

2. We tentatively conclude that permitting unlicensed operation in the 3650 MHz band would foster the introduction of new and advanced services to the American public, especially in rural areas, and will result in a more efficient use of spectrum. This band appears particularly well suited to respond to the needs expressed by the growing number of entrepreneurial wireless internet service providers (WISPs) who are today bringing broadband services to consumers in rural areas of the United States who have many fewer choices for such services than consumers in more populated areas. WISPs have been asking the Commission for additional spectrum for unlicensed uses to provide both backhaul service and broadband service to their customers.² Among the various alternatives we are considering, this spectrum is particularly promising in part because the incumbents -- FSS earth stations that are limited to international intercontinental traffic -- are concentrated primarily on the coasts, leaving available the rural areas targeted by these providers. In addition, unlicensed use in this band would complement existing unlicensed operations in the 2.4 GHz band and new operations in the 5 GHz band by enabling the manufacture of devices that can use more than one of these band segments. Taken together, these

¹ See Amendment of the Commission’s Rules With Regard to the 3650-3700 MHz Government Transfer Band; The 4.9 GHz Band Transferred from Federal Government Use, *First Report and Order and Second Notice of Proposed Rule Making*, ET Docket No. 98-237, WT Docket No. 00-32, 15 FCC Rcd 20488 (2000) (*3650 MHz Allocation Report & Order* and *3650 MHz Service Rules Second Notice*, respectively).

² See Revision of Parts 2 and 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz band, *Report and Order*, ET Docket No. 03-122, 69 Fed. Reg. 2677 (2004) at ¶ 17. See also, numerous comments filed in response to *Spectrum Policy Task Force Report*, ET Docket No. 02-135, November 2002; e.g., comments of License-Exempt Alliance, PART-15.ORG, the Wireless Ethernet Compatibility Alliance, Microsoft and Cisco.

proposals should provide substantial opportunities for future, high-power, unlicensed devices and achieve efficient use of this 50 megahertz block of spectrum. As a result, these proposals should facilitate the rapid deployment of advanced telecommunications services and technologies to all Americans, especially in rural areas of the United States, thus promoting the objectives of Section 706 of the Telecommunications Act of 1996.³

3. In addition, in order to ensure that we can consider other possible approaches to achieve our goals for this 50 megahertz block of spectrum, we also are seeking comment here on alternative options that could potentially provide a combination of unlicensed and licensed terrestrial services in this band. For example, we could include both FSS and FS licensed operations sharing the band while still allowing for unlicensed devices in the band, or split the band to allow separate spectrum for unlicensed and terrestrial licensed use, all in conjunction with FSS operations. Ultimately, our goal is to maximize the efficient use of this band and foster the introduction of new and advanced services.

II. BACKGROUND

4. Historically, the 3500-3700 MHz band was exclusive Federal Government spectrum, allocated on a primary basis for radiolocation services. Subsequently, the band was also allocated to the non-government radiolocation service on a secondary basis.⁴ In 1984, the Commission added a primary allocation in the 3600-3700 MHz band for non-government FSS (space-to-Earth), but adopted footnote US245 to restrict use of this FSS allocation “to international inter-continental systems . . . subject to case-by-case electromagnetic compatibility analysis.”⁵

A. Government Transfer Spectrum

5. The Omnibus Budget Reconciliation Act of 1993 (OBRA-93) required that the Secretary of Commerce identify at least 200 megahertz of spectrum then allocated for use by Federal Government agencies to be transferred to private sector use.⁶ In February 1995, pursuant to OBRA-93, the National Telecommunications and Information Administration (NTIA) released its Final Report on spectrum for

³ See Pub.L. 104-104, Title VII, § 706, Feb. 8, 1996, 110 Stat. 153, reproduced in the notes under 47 U.S.C. § 157 (*Section 706*). Section 706(c)(1) defines “advanced telecommunications capability . . . without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data graphics, and video telecommunications using any technology.” See, generally, Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, CC Docket 98-146, *Second Report*, FCC 00-290, (rel. Aug. 21, 2000) (*Section 706 Second Report*).

⁴ Table of Frequency Allocations, 47 C.F.R. § 2.106, footnote US110.

⁵ Table of Frequency Allocation, 47 C.F.R. § 2.106, footnote US245. See also Amendment of Part 2 of the Commission's Rules Regarding Implementation of the Final Acts of the World Administrative Radio Conference, Geneva, 1979, General Docket 80-739, *Second Report and Order*, FCC 83-511, 49 Fed. Reg. 2,357 (Jan. 19, 1984). In this Report and Order, the Commission also allocated the 5850-5925 MHz band to the FSS (Earth-to-space). The 3625-3700 MHz downlink segment and the 5850-5925 MHz uplink band are traditionally known as “extended C-band” (the 3700-4200 MHz downlink band and the 5925-6425 MHz uplink band are known as C-band).

⁶ Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, 107 Stat. 312 (1993) (OBRA-93). OBRA-93 required that all 200 megahertz of spectrum recommended for reallocation be located below 5 gigahertz, with at least 100 megahertz of this spectrum below 3 gigahertz. See Federal Communications Commission Plan for Transferred Government Spectrum, Report to the President and the Congress (rel. Mar. 1999) (report to the President and Congress on the allocation and assignment of spectrum transferred from Federal Government use to private sector use).

reallocation.⁷ In pertinent part, the Final Report identified the 3650 MHz band for transfer, effective January 1999, from a government/non-government shared use status to a mixed-use status.⁸ While the 3650 MHz band is now predominately available for non-government use, a condition of the transfer allows government radiolocation stations to continue to operate indefinitely in the band at Pascagoula, Mississippi; Pensacola, Florida; and Saint Inigoes, Maryland.⁹ We also note that the adjacent 3600-3650 MHz band continues to be used by high power federal government radar systems that are not limited to the three protected sites.

B. Substitute Spectrum

6. The Balanced Budget Act of 1997 (BBA-97) required that the Commission assign by competitive bidding a total of 55 megahertz of non-Government spectrum, and further directed the Commission to reallocate the 2110-2150 MHz band and 15 megahertz from the 1990-2110 MHz band for this purpose.¹⁰ The President, however, was given the authority to identify an alternate 15 megahertz of spectrum for competitive bidding, if spectrum in the 1990-2110 MHz band could not be reallocated due to the need to protect incumbent Federal Government operations from interference, provided that the President determine that allocation of other spectrum better served the public interest and “[c]ould] reasonably be expected to produce comparable receipts.”¹¹ BBA-97 further provided that if the President made such a determination, then the President shall “identify alternative bands of frequencies totaling 15 megahertz.”¹² The President exercised this option on the basis of the need to protect Federal Government systems and, through NTIA, identified four groups of alternative bands that could be assigned by competitive bidding instead of 15 megahertz between 1990-2110 MHz.¹³ The four alternatives were: (1) 944-960 MHz; (2) 1390-1400 MHz, 1427-1432 MHz, and 1670-1675 MHz; (3) un-auctioned parts of the 2500-2690 MHz band; or (4) 3650-3700 MHz.¹⁴

C. Allocation NPRM and FSS Application Freeze Orders

7. In December 1998, in ET Docket No. 98-237, the Commission released a *Notice of Proposed Rulemaking (3650 MHz Allocation Notice)* proposing to allocate the 3650 MHz band to the non-government fixed service on a primary basis and tentatively concluding not to allocate the band to land

⁷ Spectrum Reallocation Final Report, Response to Title VI – Omnibus Budget Reconciliation Act of 1993, U.S. Department of Commerce, NTIA Special Publication 95-32 (Feb. 1995) (*Spectrum Reallocation Final Report*).

⁸ See Spectrum Reallocation Final Report, Response to Title VI - Omnibus Budget Reconciliation Act of 1993, NTIA Special Publication 95-312, released February 1995 (*Final Report*). “Shared use” means that a band of frequencies is generally available for both government and non-government use. See 47 C.F.R. § 2.105(b). “Mixed use” means that Federal government use is limited by geographic area, by time or by other means so as to guarantee that the potential use by Federal government stations is substantially less than the potential use to be made by non-government stations. See Section 113(b)(2)(B) of OBRA-93. See, also, 47 U.S.C. § 923(b)(2)(B).

⁹ The *Spectrum Reallocation Final Report* listed one of the three government radiolocation stations to be grandfathered as being located at Memphis, Tennessee. Subsequent to the release of the Final Report, however, the Memphis, Tennessee site was closed and the facilities at this site were moved to Pensacola, Florida. Frequency assignment action for these operations at Pensacola, Florida were initiated in June 1995, and were approved through the Department of Commerce’s assignment process in October 1995. The Department of Commerce has established that the “radius of operation” for these grandfathered government radiolocation stations is 80 kilometers (49.7 miles). See *Spectrum Reallocation Final Report*, at 4-16 through 4-21.

¹⁰ Balanced Budget Act of 1997, Pub. L. No. 105-33, 111 Stat. 251 (1997) (*BBA-97*).

¹¹ Section 3002(c)(4) of BBA-97.

¹² *Id.*

¹³ See *Identification of Alternate Bands in Response to the Balanced Budget Act of 1997*, NTIA 98-39 (Nov. 1998).

¹⁴ *Id.*

mobile service.¹⁵ In order to preserve the availability of the band for fixed service, the Commission sought comment on whether to delete the FSS allocation in the band, but stated that, if it took this course of action, it would grandfather existing FSS earth station sites in the band.¹⁶ In a companion *Order (FSS Application Freeze Order)*, the Commission stated that it would no longer accept applications in the 3650 MHz band for: (1) new FSS earth stations, (2) major amendments to pending FSS earth station applications, or (3) applications for major changes in existing FSS earth stations.¹⁷ This freeze was intended to ensure that adequate opportunities would continue to exist for the provision of fixed operations in the band. Subsequently, in May 2000, the Commission released a *Memorandum Opinion and Order (FSS Freeze MO&O)* modifying the freeze by providing limited relief.¹⁸ Specifically, the Commission stated that it would accept applications for new FSS earth stations and major modifications of existing FSS earth stations in the band if the proposed earth station facilities were located in close proximity (*i.e.*, 10 miles or less) to an existing, grandfathered FSS earth station operating in the band.¹⁹

D. Allocation Order

8. In October 2000, the Commission released a *First Report and Order (3650 MHz Allocation Report & Order)* that allocated the 3650 MHz band to fixed and mobile terrestrial services (FS and MS) on a co-primary basis, but in order to protect grandfathered FSS earth station and Federal Government radiolocation operations, limited the mobile allocation to base station use only.²⁰ The Commission found that the 3650 MHz band was an equivalent and viable substitute for the 15 megahertz of spectrum at 1990-2110 MHz and, accordingly, concluded that initial FS and MS licenses in the 3650 MHz band would be assigned by competitive bidding.²¹ The *3650 MHz Allocation Report & Order* grandfathered existing FSS earth station sites in the band indefinitely on a primary basis and established that applications for FSS earth stations to be located within 10 miles of existing grandfathered sites had to be submitted prior to December 1, 2000 in order for those FSS earth stations to be grandfathered on a primary status. The Commission determined to allow additional FSS earth station operations in the band on a secondary basis.

9. In addition, in the *3650 MHz Allocation Report & Order*, the Commission deleted the unused secondary non-government radiolocation allocation.²² The Commission also deleted the government radiolocation allocation, but it grandfathered the three existing government radiolocation sites that were a condition of the transfer.²³ In a footnote to the Table of Frequency Allocations, the Commission adopted an 80 kilometer coordination radius around the three grandfathered government radiolocation sites.²⁴ As the Commission explained, this requirement means that non-government terrestrial service and FSS earth

¹⁵ Amendment of the Commission's Rules with Regard to the 3650-3700 MHz Government Transfer Band, ET Docket No. 98-237, *Notice of Proposed Rule Making and Order*, 14 FCC Rcd 1295 (1998) (*3650 MHz Allocation Notice and FSS Allocation Freeze Order*, respectively).

¹⁶ *Id.* at 1306 ¶ 14.

¹⁷ *Id.* at 1296-97 ¶ 2.

¹⁸ Amendment of the Commission's Rules With Regard to the 3650-3700 MHz Government Transfer Band, ET Docket No. 98-237, *Memorandum Opinion and Order*, 15 FCC Rcd 9340 (2000) (*FSS Freeze MO&O*).

¹⁹ *Id.* at 9341-42 ¶ 4.

²⁰ The Commission's decision not to permit aeronautical mobile operations in the band is also consistent with the international allocation for the band.

²¹ *Id.* at 20497-98 ¶¶ 19-20.

²² *3650 MHz Allocation Order*, 15 FCC Rcd at 20503 ¶ 34.

²³ *Id.* at 20504-05 ¶¶ 35-38.

²⁴ Table of Frequency Allocations, 47 C.F.R. § 2.106, footnote US348.

stations located within 80 kilometers of the three grandfathered government radiolocation stations may not cause interference to the grandfathered government radiolocation operations, that they must accept any interference received from such operations, and that they must be coordinated before commencing operation.²⁵ Finally, the Commission deleted the unused government aeronautical radionavigation service (ground-based) allocation.²⁶

10. In response to the *3650 MHz Allocation Report & Order*, the Commission received four Petitions for Reconsideration and an Emergency Motion for Stay.²⁷ The petitions request that the Commission return the band's full FSS allocation and delete the Fixed Service and Mobile Service allocations. These petitions and the emergency motion are presently pending. In the interim, the International Bureau has authorized four additional earth stations in the band on a primary basis by waiving the current secondary FSS allocation for new earth stations.²⁸

E. Service Rules NPRM

11. Concurrently with adoption of the *3650 MHz Allocation Report & Order*, the Commission adopted a *Second Notice of Proposed Rule Making (3650 MHz Service Rules Second Notice)* seeking comment on licensing and service rules for Fixed Service and Mobile Service. In the *3650 MHz Service Rules Second Notice*, the Commission tentatively concluded to license fixed and mobile services in the 3650 MHz band under Part 27 of the Commission's rules.²⁹ The Commission also tentatively concluded to use wide area licensing and sought comment on the appropriate geographic licensing area or areas to use and spectrum blocks. In addition, the Commission sought comment on the feasibility of pairing the 3650 MHz band with the 4940-4990 MHz (4.9 GHz) band for mobile services and whether such a pairing would encourage synergies in the use of both portions of the spectrum.

12. The Commission indicated that all FSS earth station operations being grandfathered on a primary basis in the band and all new FSS earth stations operating on a secondary basis in the band would continue to be governed by the Commission's Part 25 satellite licensing and service rules. The Commission proposed an FSS build-out requirement in case a fixed and mobile services licensee chose to use this spectrum for FSS earth station operations. In addition, the Commission proposed various technical rules regarding in-band and adjacent band interference controls, including the establishment of coordination zones around grandfathered FSS earth station operations. The Commission also proposed to

²⁵ *3650 MHz Allocation Order*, 15 FCC Rcd at 20504 ¶ 36. See also Table of Frequency Allocations, 47 C.F.R. § 2.106, footnote US348. The Commission also determined to allow government radiolocation operations in the 3650 MHz band on Naval vessels at a distance of at least 44 nautical miles in off-shore ocean areas on the condition that harmful interference is not caused to non-government operations. See Table of Frequency Allocations, 47 C.F.R. § 2.106, footnote US349.

²⁶ *3650 MHz Allocation Order*, 15 FCC Rcd at 20506 ¶ 39.

²⁷ Petitions for Reconsideration were filed by: Lockheed Martin Corporation, the Extended C-Band Ad Hoc Coalition, Inmarsat Ltd., and Lockheed Martin Corp, all on December 18, 2000. The Extended C-Band Ad Hoc Coalition filed its Emergency Motion for Stay Pending Reconsideration on November 28, 2000.

²⁸ New Skies Network, Inc. Request for Permanent Authority to Operate a Fixed Satellite Service Downlink Earth Station in the Extend C Band in the 3625-3700 MHz Band at Bristow, Virginia, Application File No. SES-LIC-20001130-02220 (E000696); Astrolink Request for Modification to its Existing Authority to Conduct Tracking, Telemetry, and Control Operations (TT&C) in the Extend C Band in Brewster, Washington, Application File No. SES-MOD-20011101-02077 (E000727); Lockheed Martin Request for Permanent Authority to Operate a Fixed Satellite Service Downlink Earth Station in the Extend C Band in the 3650-3700 MHz Band at Carpentersville, New Jersey), Application File No. SES-MOD-20001130-02268 (E7541); MCI WorldCom Network Services, Inc. requests for Permanent Authority to Operate a Fixed Satellite Service Downlink Earth Station in the Extend C Band in the 3625-3700 MHz at Yacolt, Washington, application File Nos. SES-MOD-19990820-01536 (KA323) and SES-MOD-19990820-01537 (KA221).

²⁹ *3650 MHz Band Service Rules NPRM*, 15 FCC Rcd at 20508 ¶ 45.

delete footnote US245 restricting the 3600-3700 MHz band “to international inter-continental systems . . . subject to case-by-case electromagnetic compatibility analysis.”

13. In response to the *3650 MHz Service Rules Second Notice*, the Commission received 17 comments and seven reply comments. Comments were submitted on behalf of telecommunications providers that serve predominately rural areas of the country and Internet Service Providers who wish to provide wireless Internet service to their customers. These commenters expressed interest in utilizing the 3650 MHz band for licensed terrestrial services.³⁰ Satellite entities filed comments expressing concern that licensed fixed and mobile services could cause interference with FSS operations in the band.³¹ In addition, representatives of the public safety community filed comments opposing the possible pairing of the 3650 MHz band with the 4.9 GHz band.³² Subsequent to the release of the *3650 MHz Service Rules Second Notice*, the Commission designated the 4.9 GHz band for exclusive public safety use and, thus, it is no longer available for commercial use.³³ To date, the Commission has not taken any further action with respect to adopting fixed and mobile licensing and service rules for the 3650 MHz band.

F. Unlicensed Spectrum NOI

14. In December 2002, in ET Docket No. 02-380, the Commission released a *Notice of Inquiry (Unlicensed Spectrum NOI)* seeking comment, in part, on the possibility of lifting the current prohibition on unlicensed operations in the 3650 MHz band.³⁴ The Commission stated that the change in the allocation of the 3650 MHz band from Federal Government/non-Federal Government shared use to mixed use provided us with an opportunity to revisit the prohibition. The Commission also sought to develop a record on whether unlicensed devices could operate in the 3650 MHz band at power levels significantly higher than the maximum currently permitted under Part 15. Among other issues, the Commission asked whether: (1) licensed fixed operations could exist in this spectrum and unlicensed Part 15 devices could operate in unused portions of the spectrum on a non-interference basis, and (2) what types of licensed services could share the 3650 MHz band with unlicensed devices.

15. In the *Unlicensed Spectrum NOI*, the Commission stated its interest in learning whether it might be possible to permit unlicensed devices to operate in the 3650 MHz band with relaxed technical restrictions while protecting licensed users from receiving interference. For example, the Commission observed that it might be possible to permit widespread operation with high gain antennas at transmitter power levels greater than the 1-Watt maximum permitted for other unlicensed devices. The Commission also indicated that it might be necessary to require that unlicensed devices allowed to operate in this band have capabilities such as frequency agility to avoid causing interference to any fixed service operations

³⁰ See, e.g., comments of Adaptive Broadband Corporation, Advanced TelCom, Inc., Global Frontiers, Inc, Innowave ECI Wireless Systems Ltd, National Telephone Cooperative Association, Rural Carriers, and Transcomm.

³¹ See, e.g., comments of Astrolink International LLC, Comsearch, Extended C-Band Ad Hoc Coalition, EchoStar Satellite Corporation, GE American Communications, Inc., Inmarsat, and Lockheed Martin Corporation.

³² See, e.g., comments of Association of Public-Safety Communications Officials-International, Inc., Major Cities Chiefs, and Motorola, Inc.

³³ See *The 4.9 GHz Band Transferred from Federal Government Use*, WT Docket No. 00-32, *Second Report and Order and Further Notice of Proposed Rule Making*, 17 FCC Rcd 3955 (2002).

³⁴ See *Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, ET Docket No. 02-380, *Notice of Inquiry*, 17 FCC Rcd 25632 (2002) (*Unlicensed Spectrum NOI*). The *Unlicensed Spectrum NOI* explored the possibility of permitting unlicensed operations in both the TV bands below 900 MHz as well as the 3650 MHz band. The instant Notice focuses only on our proposals for the 3650 MHz band. The TV bands below 900 MHz will be addressed in a separate proceeding.

licensed in the band.³⁵ The Commission further indicated that relaxed technical requirements could encourage the introduction of new and innovative types of unlicensed devices for the benefit of all Americans -- especially those in rural areas.³⁶ For example, permitting the use of higher power levels and high gain antennas would substantially increase the operational range of unlicensed devices, which could thereby foster the development of new types of wireless data networks that could prove attractive to wireless Internet service providers (WISPs).

16. With respect to the 3650 MHz band, a number of commenters express support for the idea of lifting the unlicensed use restriction in the 3650 MHz band.³⁷ In particular, unlicensed equipment manufacturers encourage the Commission to allow such operations, and WISPs express interest in using this band for point-to-point links.³⁸ Several commenters assert that mitigation measures such as geographic limitations, power limitations, frequency hopping and/or the use of smart devices can be implemented to permit deployment of unlicensed devices in the 3650 MHz band while still protecting earth stations from interference.³⁹ Other commenters, however, argued that the unlicensed use restriction should not be lifted.⁴⁰

17. Commenters representing satellite entities express mixed opinions with regard to allowing unlicensed operation in the 3650 MHz band. For example, the Satellite Industry Association (SIA) argues that interference to earth stations could be caused by unlicensed operations at significant distances, and that geographic restrictions and requirements to include geo-location technology are not sufficient to prevent interference. SIA also expresses concern that emissions from devices in the 3650 MHz band could interfere with FSS operations in the adjacent 3700-4200 MHz band.⁴¹ On the other hand, the Coalition of Program Networks and Distributors, Broadcast Networks, Satellite Operators and Others (Coalition) states that it does not oppose unlicensed use of the band, but cautions that sufficient technical analysis should be undertaken to establish suitable power levels, modulation types and antenna configurations for unlicensed devices that would prevent interference.⁴² In that regard, the Coalition states that, although it is possible that excessive unlicensed use of the 3650 MHz band could have the potential of causing interference to the reception of satellite signals in adjacent bands, it has not conducted an independent analysis of the interference potential. We also note that another satellite interest group, the Coalition of C-Band Constituents (the "C-Band Coalition") submitted a study, both in

³⁵ In this regard, we note that dynamic frequency selection and transmitter power control are already required safeguards for unlicensed operation in the 5.8 GHz band. Furthermore, the Commission is presently exploring the potential benefits of cognitive radio technologies, in a more generic context, in another rulemaking proceeding. *See* Facilitating Opportunities for Flexible, Efficient, and Reliable Spectrum Use Employing Cognitive Radio Technologies, ET Docket No. 03-108, *Notice of Proposed Rulemaking and Order*, (rel. Dec. 30, 2003) (*Cognitive Radio Notice*).

³⁶ *See Unlicensed Spectrum NOI*, 17 FCC Rcd at 25642 ¶ 20. *See also* Facilitating the Provision of Spectrum-Based Services to Rural Areas and Promoting Opportunities for Rural Telephone Companies To Provide Spectrum-Based Services, WT Docket No. 02-381, *Notice of Proposed Rulemaking*, 18 FCC Rcd 20802 (2003).

³⁷ *See, e.g.*, comments of American Petroleum Institute, IEEE 802.18 RR-TAG, The Land Mobile Communications Council, and Lakeland Communications, Inc.

³⁸ *See, e.g.*, comments of Intersil Corporation and Symbol Technologies, Inc., Kerry Penland/Big Tube Wireless LLC, and Netrepid.

³⁹ *See* comments of AT&T Corporation and Intersil Corporation and Symbol Technologies, Inc. *See also* comments of NTIA (unlicensed devices could utilize various mitigation techniques to facilitate sharing with federal radar facilities in the band).

⁴⁰ *See, e.g.*, comments of Cingular and Motorola.

⁴¹ *See* comments of Satellite Industry Association.

⁴² The Coalition membership consists of program networks and distributors, broadcast networks, satellite operators and others that use the 3700-4200 MHz band.

this proceeding and in ET Docket No. 98-153, addressing the potential for ultra-wideband devices to interfere with C-band frequencies in the 3700-4200 MHz band in this proceeding.⁴³

III. DISCUSSION

18. We believe that the 3650 MHz band is well-suited for the provision of new and advanced services to the American public, particularly in rural areas. Because incumbent FSS earth stations do not exist in much of the continental United States, this band appears particularly well suited to satisfy the demands of existing service providers using unlicensed devices for spectrum with which to enhance service to rural areas through high power unlicensed operation. Furthermore, as we observed in the *Unlicensed Spectrum NOI*, the rules for unlicensed operation of RF devices have been very successful in providing consumers and businesses with a wide variety of additional choices to obtain and use information.⁴⁴ Today, for example, a growing number of WISPs are emerging with the intention of providing an alternative to DSL and cable for high-speed connections into the home or office. The use of unlicensed RF devices appears to have proven to be ideally suited to bridge the gap, especially in rural areas, where cable or DSL services have been slow to arrive. Small entities with limited resources have stepped in to provide such service in areas that other service providers have not prioritized. In numerous fora, these providers have expressed a desire for additional spectrum that could be used on an unlicensed basis, especially on a higher-power basis.⁴⁵ These providers have stated that existing spectrum available for unlicensed operation is not adequate to accommodate Wireless Metropolitan Area Networks (MANs) or broadband access in all rural areas.⁴⁶ In short, we see that there is a growing demand for higher-powered unlicensed devices operating at lower frequencies where the combination of propagation characteristics and higher power are more conducive to longer-range communications.

19. Consequently, we tentatively conclude that allowing unlicensed operations in the 3650-3700 MHz band would hold great promise for addressing those needs. This contiguous 50 megahertz block of spectrum is sufficiently wide to permit wide bandwidth applications such as high-speed data transmissions which, for example, could serve to better encourage its use for Internet service or backhaul by WISPs due to the relatively low entry barriers posed by unlicensed operation as compared with licensed operations. Also, the 3650-3700 MHz band could be used to enhance the utility of existing unlicensed operations by creating the potential for additional synergies. This band is situated between the 2.4 GHz (2400–2483.5 MHz) and 5.8 GHz (5.15–5.825 GHz) bands which are commonly used on an unlicensed basis. In addition, our proposals here would appear to facilitate the development and deployment of devices and systems capable of identifying and using the optimal band at any given time, such as under the newly adopted IEEE 802.16a (“WiMax”) standard. We envision multi-band systems which can analyze the operating environment and automatically select from the 2.4 GHz, 3650 MHz, or

⁴³ See “Study of Interference by UWB and Unlicensed Devices to C-Band Earth Station Receivers.” Filed as comments in ET Docket Nos. 98-153 and 02-380.

⁴⁴ Under these rules, a wide variety of innovative devices have been developed and introduced for consumer and business use, including cordless telephones, home security systems, electronic toys, anti-pilfering and inventory control systems and computer local area networks. Moreover, the past few years have witnessed the development of industry standards, such as IEEE 802.11b (Wi-fi), Bluetooth, and Home RF that have greatly expanded the number and variety of devices that operate in the 2.4 GHz Industrial, Scientific and Medical (ISM) band. (These operating standards provide manufacturers with guidance for developing spread spectrum devices for the 2.4 GHz band. The IEEE 802.11b standard applies to direct sequence devices, while the Bluetooth and Home RF standards apply to frequency hopping devices.) This progress has enabled the introduction of wireless headsets and computer connections for cellular and PCS phones, wireless computer peripherals such as printers and keyboards, and a host of new wireless Internet appliances.

⁴⁵ See, e.g., *Rural Forum*; *ET Docket 03-122*; *WT Docket [Rural NOI/NPRM]*

⁴⁶ See, e.g., Cisco comments at 3, reply comments at 7; Microsoft comments at 9, reply comments at 4; and Motorola comments at 4, reply comments at 2-3.

5.8 GHz bands. Systems of this type would be able to more effectively support applications such as broadband connectivity, distance learning, and telemedicine in many rural or underserved communities as well as on Native American Tribal lands.

20. While our central proposal is for the use of unlicensed devices with cognitive radio techniques, we also wish to ensure that we can consider other possible approaches to achieve our goals; and thus we are seeking comment on various options that involve the use of licensed terrestrial services, such as those that may operate with lower power levels than those normally associated with licensed use. Specifically, we seek comments on various technical and operational issues associated with such options, and seek comment on whether some portion of the 3650 MHz band should be designated for licensed terrestrial use.

A. Allocation Issues

21. In broad terms, we believe that widespread use of the unlicensed devices proposed in this Notice could be more readily encouraged if such devices were to coexist with only FSS operations in the 3650 MHz band. We reach this tentative conclusion because, as discussed more fully below, the current FSS allocation, which is limited to international intercontinental operations, results in earth stations being sited primarily on the east and west coasts, thus leaving much of the continental United States available for other uses. Moreover, we believe that even a moderate presence of potentially ubiquitous terrestrial services under a licensed allocation could hamper or preclude the operation of unlicensed devices in large geographic areas – including, especially, rural America where the need is greatest. Therefore, our initial proposal to allow unlicensed operation in either all, or portions of, the 3650 MHz band would also entail retention of an FSS allocation that is limited to international intercontinental use, and the deletion of the existing terrestrial FS/MS allocations in any portions of the band in which unlicensed operation would be allowed.

22. Of course, if we ultimately adopt an alternative approach that authorizes licensed terrestrial services in the 3650 MHz band, we would reflect that by adopting or maintaining a terrestrial allocation enabling that approach. In our discussion of licensed alternatives below, we also discuss whether to modify the relative protection status of future FSS earth stations if we retain a FS and MS allocation.

23. In the following paragraphs of this section, we discuss more fully the current FSS and FS/MS allocations in the 3650 MHz band. We seek comment on what allocation changes would maximize efficient use of this spectrum.

1. FSS Allocation

24. In the *3650 MHz Allocation Order*, the Commission determined to grandfather existing FSS earth station operations on a primary basis and to permit new FSS earth station operations on a secondary basis. The Commission reasoned that allowing new FSS earth station operations on an unrestrained co-primary basis would impede any potential widespread use of the band for terrestrial services.⁴⁷ Due to the weak signals that are received in the FSS, it was determined that coordination with the high-powered terrestrial operations would result in potentially large geographic areas where terrestrial services could not operate to avoid interference to FSS. The Commission stated that the size and shape of these “exclusion zones” could be different for each FSS earth station site because of factors associated with shielding, antenna orientation and terrain elevation. The Commission found that these coordination requirements and the presence of exclusion zones would significantly increase transaction costs and create a disincentive for deployment of new terrestrial operations. Thus, the Commission found that unrestrained deployment of FSS earth stations could hinder or greatly inhibit the opportunities for terrestrial operations in the band.

⁴⁷ *3650 MHz Allocation Order*, 15 FCC Rcd at 20497 ¶ 18.

25. Since the decision to allow new FSS earth station operations in the 3650 MHz band only on a secondary basis, significant strides have been made in the area of smart/cognitive radio technologies. By using these features, as more fully discussed below, we seek comment on whether we should revise the 3650 MHz band's existing allocations to permit new FSS operations in the band on a co-primary basis with unlicensed devices. Note that the scope of this Notice does not contemplate any changes to the FSS earth station operations grandfathered indefinitely on a primary basis in the band pursuant to the *3650 MHz Allocation Order*. We discuss in Section C whether, if we maintain an FS/MS allocation, we should revisit the FSS allocation.

26. While we seek comment on the possibility of permitting new FSS operations in the band on a primary or co-primary basis, we propose to retain the application of footnote US245 to the Table of Frequency Allocations. This footnote restricts FSS use of the 3650 MHz band to international intercontinental operations. Although deletion of the footnote could provide more flexibility for FSS operations in the band, we also believe that more extensive FSS use could curtail the efficient use of this band by terrestrial operations, whether licensed or unlicensed; and, potentially, increase the costs associated with coordinating other co-primary users of the band, thus inhibiting opportunities for such operation. In contrast, retaining the application of footnote US245 would make this band particularly attractive for intensive use by a wide array of advanced wireless technologies including higher-powered unlicensed devices. We seek comment on our proposal to retain footnote US245. Alternatively, we seek comment on whether we should recast footnote US 245 as a new footnote particularly for the 3650 MHz band (e.g., as footnote NGxxx), without the requirement for case-by-case electromagnetic compatibility analysis.⁴⁸

27. As indicated above, four parties representing FSS interests filed Petitions for Reconsideration of the decisions made in the *3650 MHz Allocation Order*.⁴⁹ In addition, an Emergency Motion for Stay was filed. In broad terms, these petitioners request that we reverse the Commission's decision to make future FSS operations secondary in the 3650 MHz band. If we revise the 3650 MHz band's allocations to include primary or co-primary status for new FSS operations, this decision would substantially effect the disposition of those petitions. Accordingly, we defer further action on the Petitions for Reconsideration and the Emergency Motion for Stay of the *3650 MHz Allocation Order* pending our adoption of final rules concerning the allocation proposals herein.

2. Fixed Service and Mobile Service Allocations

28. The 3650 MHz band's current primary allocation provides for Fixed and Mobile (base station only) operations. As mentioned above, if we adopt our proposal for unlicensed use in any portion of the 3650 MHz band, we propose to delete the FS and MS allocations for the portion designated for unlicensed use. We believe that the provision of ubiquitous licensed terrestrial services, in addition to FSS operations, would hinder the successful deployment of unlicensed devices in many areas. As discussed more fully below, one alternative approach could involve segmenting the 3650 MHz band into one portion that would allow only unlicensed and FSS operations, and another portion that would allow only licensed and FSS operations.

29. However, we seek comment on whether the 3650 MHz band's current Fixed and Mobile (base station only) allocations should be maintained, modified or deleted. In particular, we seek comment on whether there is any need or interest for licensed terrestrial services. While the range of licensed services that might be implemented under the fixed and mobile allocation could be limited, we believe that, with some modification to the allocation that is described more fully below, the band could

⁴⁸ We note that the electromagnetic compatibility analysis was required in this band for the purpose of sharing with the Federal Government radiolocation service, which, for the 3650 MHz band, is now covered by footnotes US348 and US349.

⁴⁹ *Id.*

accommodate various new and advanced licensed services, including the above-mentioned services that could be provided by unlicensed devices.

3. Section 3002(c)(4) of the 1997 Balanced Budget Act

30. Section 3002(c)(4) of the BBA required the Commission, among other things, to reallocate 15 megahertz of spectrum for licenses to be assigned by competitive bidding and established deadlines for actions to accomplish this objective.⁵⁰ The Commission originally proposed reallocating the requisite 15 megahertz specified in the BBA from the 2025-2110 MHz portion of the 1990-2110 MHz band. However, as indicated above, NTIA thereafter informed the Commission of its objections to reallocating the 2025-2110 MHz portion of the 1990-2110 MHz band for competitive bidding due to existing allocations for Federal operations and, in further accordance with Section 3002 (c)(4) of the BBA, identified alternative frequencies that included, among others, the 3650 MHz band.⁵¹ As noted above, the FS/MS allocations adopted in the *3650 MHz First Report & Order* were intended, in part, to satisfy certain statutory auction requirements for various frequency bands.⁵² Subsequently, in the *Unlicensed Spectrum NOI*, we noted that although the Commission had previously found that the allocation and subsequent auction of the 3650 MHz band to fixed terrestrial services would satisfy the statutory requirement of BBA, 15 megahertz of spectrum made available as part of the *27 MHz Proceeding*, some of which was recently auctioned,⁵³ might also have the potential to fulfill this purpose.⁵⁴

31. Based on intervening events, the passage of time, and subsequent Commission rulemakings,⁵⁵ we consider it reasonable to conclude that we do not have any remaining statutory obligations under Section 3002 of the BBA. However, to the extent that it might be argued that our obligations under Section 3002 remain unfulfilled despite these factors, we have several alternative options with which to fulfill them, as noted below. Specifically, in the *Third R&O, Third NPRM, and 2nd MO&O* in ET Docket No 00-258, the Commission reallocated 30 megahertz of spectrum from Mobile-Satellite Service (MSS) to the Fixed and Mobile services that could, *inter alia*, be used to support advanced wireless services

⁵⁰ Section 3002 (c)(4) of BBA reads, in part, as follows:

c) Commission Obligation To Make Additional Spectrum Available by Auction.--

[* * *]

(4) Use of 15 megahertz from bands at 1,990-2,110 megahertz.

--The Commission shall reallocate 15 megahertz from spectrum located at 1,990-2,110 megahertz for assignment by competitive bidding unless the President determines such spectrum cannot be reallocated due to the need to protect incumbent Federal systems from interference, and that allocation of other spectrum (A) better serves the public interest, convenience, and necessity, and (B) can reasonably be expected to produce comparable receipts. If the President makes such a determination, then the President shall, within 2 years after the date of enactment of this Act, identify alternative bands of frequencies totaling 15 megahertz, and report to the Congress an identification of such alternative bands for assignment by competitive bidding. . . [* * *]

⁵¹ See *Identification of Alternate Bands in Response to the Balanced Budget Act of 1997* at n. 13 *supra*.

⁵² See para. 8, *supra*.

⁵³ See *Public Notice, 1670 – 1675 Band Auction Closes Winning Bidder Announced*, DA 03-1472, May 2, 2003.

⁵⁴ *Unlicensed Spectrum NOI*, 17 FCC Rcd 25641 ¶ 19, citing ET Docket No. 00-221 (*27 MHz Proceeding*).

⁵⁵ Auction Reform Act of 2002, Pub. L. No. 107-195, 116 Stat.; See *AWS Third R&O, Third NPRM, and 2nd MO&O* at n. 52 *supra*, and *27 MHz Proceeding* at n. 54 *supra*.

(AWS), including 15 megahertz of spectrum in the 1990-2000 MHz and 2020-2025 MHz bands.⁵⁶ Notably, these spectrum bands also fall within the same 1990-2110 MHz range originally specified by the BBA, and are not excluded from consideration by Section 3002 (c)(1)(C).⁵⁷ Moreover, this spectrum appears to meet the criteria for reassignment originally specified in Section 3002 (c)(2).⁵⁸ We note, however, that several parties have asked to be relocated to a portion of the 1990-2000 MHz and 2020-2025 MHz spectrum to support existing operations.⁵⁹ In addition to the potential availability of spectrum in the 1990-2110 MHz range, another 15 megahertz of spectrum has been allocated from MSS to possible AWS use in the 2165-2180 MHz band.

B. Proposals for Part 15 Unlicensed Operations

32. The 3650-3700 MHz band can be used to enhance the utility of existing unlicensed operations. As we stated above and in the *Unlicensed Spectrum NOI*, the distribution of incumbent FSS

⁵⁶ See *Third R&O, Third NPRM, and 2nd MO&O* in ET Docket No. 00-258, 18 FCC Rcd 2223 (2003) (*AWS Third R&O, Third NPRM, and 2nd MO&O*), reconsideration pending. This 30 megahertz consisting of the 1990-2000/2020-2025 MHz and 2165-2180 MHz bands, was reallocated from MSS as follows: 14 megahertz of spectrum that was not assigned to any of the MSS licensees and 16 megahertz of spectrum that has been “abandoned” as a result of MSS licensees not meeting initial milestones. *Id.* at 2239 ¶ 32. Applications for review of these milestone decisions remain pending. See Joint Application for Review of Constellation Communications Holdings, Inc., Mobile Communications Holdings, Inc., and ICO Global Communications (Holdings) Limited, File Nos. SAT-T/C-20020718-00114, SAT-T/C-20020719-00104, SAT-MOD-20020719-00103, SAT-MOD-20020719-00105 (March 3, 2003); Application for Review of TMI Communications and Company, Limited Partnership and TerreStar Networks, Inc., File Nos. File Nos. SAT-LOI-19970926-00161, SAT-AMD-20001103-00158, SAT-MOD-20021114-00237, SAT-ASG-20021211-00238 (March 12, 2003); Emergency Application for Review of Globalstar, L.P., File Nos. SAT-LOA-19970926-00151/52/53/54/56, SAT-AMD-20001103-00154, SAT-MOD-20020717-00116/17/18/19, SAT-MOD-20020722-00107/08/09/10/12 (March 3, 2003).

⁵⁷ See BBA, Section 3002 (c)(1)(C). Specifically, this spectrum had not, as of the date of enactment of the BBA, (i) been designated by Commission regulation for assignment pursuant to Section 309(j) of the Communications Act of 1934 (47 U.S.C. 309(j)) concerning competitive bidding, (ii) been identified by the Secretary of Commerce pursuant to Section 113 of the National Telecommunications and Information Administration Organization Act (47 U.S.C. 923) dealing with Government identified transfer spectrum; (iii) been allocated for Federal Government use pursuant to Section 305 of the Communications Act of 1934 (46 U.S.C. 305) dealing with Government use; (iv) been designated for reallocation under section 337 of the Communications Act of 1934 (as added by the BBA) dealing with public safety and commercial use of former TV bands, or (v) been allocated or authorized for unlicensed use pursuant to Part 15 of the Commission’s regulations under circumstances where the operation of the licensed services pursuant to competitive bidding would interfere with operation of end-user products permitted under such regulations.

⁵⁸ See BBA, Section 3002 (c)(2). Specifically, in the *Third R&O, Third NPRM, and 2nd MO&O* in ET Docket No. 00-258, 18 FCC Rcd 2223 (2000) (*AWS Third R&O, Third NPRM, and 2nd MO&O*) at paras. 28-37, the Commission determined that the 30 megahertz of spectrum reallocated from MSS for possible AWS use possessed the desirable characteristics described in the *Second R&O* in Docket 00-258, FCC 02-304, 17 FCC Rcd 23193 (2002). For example, in the *Second R&O*, the Commission generally discussed the most efficient use of the spectrum, and considered the cost of relocating existing uses to other bands or other means of communications, and coordinated the reallocation with NTIA. See paras. 9-21. In addition, the AWS allocation complies with requirements of international agreements concerning spectrum allocations. See, e.g., *Third R&O, Third NPRM, and 2nd MO&O; Notice of Proposed Rule Making and Order* in ET Docket No. 00-258, 16 FCC Rcd 598 (2001), paras. 3-4. We also believe that the deployment of AWS would complement the needs of existing public safety radio services.

⁵⁹ See *AWS Third R&O, Third NPRM, and 2nd MO&O* at 2246-47 ¶ 45; *id.* at 2255-57 ¶¶ 68-73 (seeking comment on MDS relocation spectrum, including, *inter alia*, WCA’s proposal for the 1910-1916 MHz and 1990-1996 MHz bands); Improving Public Safety Communications in the 800 MHz Band, *Notice of Proposed Rule Making*, WT Docket No. 02-55, 17 FCC Rcd 4873, 4901-04 ¶¶ 52-56 (2002) (seeking comment on Nextel’s request that we re-designate the 1910-1915 MHz and 1990-1995 MHz bands to Nextel in exchange for spectrum that Nextel would surrender for reassignment to public safety systems).

earth stations – primarily along the east and west coasts - makes this band particularly suitable for high power unlicensed operation especially in rural areas. Furthermore, since this band is situated between the 2.4 GHz (2400–2483.5 MHz) and 5.8 GHz (5.15–5.135 GHz and 5.47-5.825 GHz) bands which are commonly used on an unlicensed basis, allowing unlicensed operation in some, or all, of the 3650 MHz band could add flexibility to current service offerings in all three bands.

33. We are not persuaded by the arguments of the Satellite Industry Association (“SIA”) in its reply comments to the *Unlicensed Spectrum NOI*, that we should not provide for unlicensed operations in this band. SIA generally asserts that the potential ubiquitous uncoordinated use of unlicensed devices would not be feasible because the requirement to operate on a non-interference basis would require reducing power to impractical levels. SIA further argues that the 3650-3700 MHz band is unsuitable for unlicensed operation because there is no global allocation for such use.⁶⁰ SIA contends that the lack of such an allocation would prevent unlicensed devices from taking advantage of the economies of scale from global demand, a large manufacturing base, roaming, and reduced complexity of equipment.⁶¹ SIA points to other parties’ comments which generally support globally harmonized spectrum for unlicensed use.

34. We reject SIA’s argument against the feasibility of unlicensed operation because we tentatively conclude that mechanisms exist, as discussed below, that will provide for unlicensed use of the 3650 MHz band without causing interference to licensed FSS operations. This view is also shared by several commenters. For example, AT&T states that geographic and power limitations and other restrictions should be sufficient to permit unlicensed devices to operate successfully in this band without causing interference to licensed FSS users in this band.⁶²

35. With respect to SIA’s second argument, we find that there should be sufficient interest in domestic unlicensed use of the band to provide manufacturing incentive, notwithstanding its lack of global availability. In support, we note that many unlicensed devices that are not permitted to operate globally remain popular choices for domestic use. For example, the 902-928 MHz band is used extensively for unlicensed operations within the United States but is not available for such use in other parts of the world. We believe that the 3650–3700 MHz band has the same potential for widespread use domestically. In addition, as stated above, the band easily could be used to supplement unlicensed domestic uses in the 2.4 GHz and 5.8 GHz bands. Since the 2.4 GHz and 5.8 GHz bands are also available for unlicensed use globally, manufacturers could, for example, choose to design products with the capability to operate in all three bands, but activate the 3650 MHz functionality in products shipped only for use in the United States. For these reasons, we do not see the lack of global availability of the 3650 MHz band for unlicensed use as a hindrance to use of the 3650 MHz band for unlicensed operation.

36. We also find that the C-Band Coalition study does not address the merits of the unlicensed operations proposed for the 3650 MHz band. That study focused on the potential for ultra-wideband (UWB) devices to cause interference to earth stations operating over the frequency range of 3700 - 4200 MHz used, among others, by video and television broadcasters for dissemination of programming materials in all areas of the United States.⁶³ As described below, we are proposing smart/cognitive and other interference mitigation techniques for unlicensed devices operating in the 3650 – 3700 MHz band to protect earth stations that are generally located on the east and west coasts of the United States. The C-Band Coalition study does not take into account those techniques and thus does not present an accurate representation of potential interference from unlicensed operations to earth stations in the 3650 – 3700 MHz band.

⁶⁰ See SIA reply comments at 2.

⁶¹ *Id.* at 4.

⁶² See AT&T comments at 4.

⁶³ See n. 43, *supra*.

37. Furthermore, we tentatively conclude that allowing unlicensed devices to operate in fixed as well as non-fixed modes would provide equipment manufacturers and system operators maximum flexibility to design devices and systems to meet the needs of consumers. In the context of this proceeding, fixed-mode unlicensed operation is considered to mean non-moving devices, such as used in omnidirectional and point-to-point systems. For example, fixed devices could be used for backhaul purposes by one operator and broadband connectivity to portable devices by another. Non-fixed modes of operation could include devices used at non-permanent sites for a short period of time and devices used while in motion or during halts at unspecified points. Examples of non-fixed devices could include laptop wireless connections and mobile handset to handset operations.

38. We propose two general approaches for enabling both fixed and non-fixed unlicensed devices to operate while protecting FSS earth stations and Federal Government operations in the 3650 MHz band. The first approach, which would apply to fixed unlicensed devices, requires professional installation of each device to ensure that certain criteria are met so that operation at a particular location and power would not result in interference to any FSS earth station. The second approach, which would apply to non-fixed unlicensed devices, requires such devices to be capable of automatically adjusting the EIRP based upon detection of the presence and strength of RF transmissions from operating FSS earth stations. In practice, this latter approach would employ methods similar in nature to dynamic frequency selection (DFS) techniques used in other bands. In addition, we propose that both fixed and non-fixed unlicensed devices be required to transmit a device identification signal to facilitate determining the source of any interference that might be caused by the operation of these devices. Finally, Part 15 of the Commission's rules governs the operation of unlicensed radiofrequency devices. Therefore, as a general condition of operation, the unlicensed devices proposed herein may not cause harmful interference to authorized radio services and must accept any interference that they receive.⁶⁴

39. We seek comment on whether both fixed and non-fixed unlicensed devices should be permitted to operate in either all, or portions of, this band. Commenters should discuss all the benefits and costs associated with using all, or portions of, the 3650 MHz band for such unlicensed use.⁶⁵

1. Fixed Unlicensed Operation.

40. Because the location of an operating fixed unlicensed device does not change, the development of criteria for ensuring that FSS operations are protected from interference is greatly simplified. In particular, once an appropriate location and operating parameters are chosen for a fixed device (*i.e.*, those where its operation will not cause harmful interference to an FSS station), both the unlicensed device and the FSS should be able to operate without mutual adverse effect.

41. *Professional Installation.* To ensure that fixed unlicensed devices are established and operated in a manner that will avoid causing interference to FSS earth stations, we propose to require that such devices be installed by a professional. The professional installer would be held responsible to account for the presence of all FSS earth stations and Federal Government operations in the vicinity of the unlicensed device. Using appropriate knowledge of each earth station's location and other relevant technical characteristics, the professional installer would be required to ensure that the installation and operational characteristics of the fixed unlicensed device is unlikely to cause harmful interference and complies with the criteria discussed below. We seek comment on the qualifications an individual must possess in order to be classified as a professional installer.⁶⁶ We recognize that industry organizations

⁶⁴ See 47 C.F.R. Section 15.5.

⁶⁵ The proposed rules set forth in Appendix A reflect only the Part 15 rule changes needed to implement our proposal for unlicensed operation in the 3650 MHz band.

⁶⁶ We note that the definition of who qualifies as a "professional" installer is also being considered in ET Docket No. 03-201, 18 FCC Rcd. 18910 (2003).

such as the National Association of Radio Telecommunications Engineers (NARTE) and The Part-15 Organization have developed Professional Installer Certification programs designed to ensure that installers are able to set up unlicensed links in a manner to minimize the possibility of creating harmful interference to other users of the spectrum.⁶⁷ Should the Commission consider completion of industry-based certification programs such as these to be sufficient training to be recognized as a professional installer? What criteria should the Commission place on any such programs that it deems acceptable?

42. We believe that it would be straightforward for professional installers to obtain the information necessary to meet their responsibilities. The FCC's International Bureau Filing System (IBFS) database of satellites and associated earth stations is available on the FCC's website at: <http://svartifoss2.fcc.gov/prod/ib/forms/index.html>. The entire database can be downloaded, or a search of data records can be performed. While the current search function does not permit easy retrieval of satellite earth station records within a particular frequency band (such as 3650-3700 MHz), FCC staff is updating the IBFS system and such search capability should be in place well before any final rules are adopted in this proceeding. We invite comment on whether additional information or search capability would be helpful if we were to adopt the requirement for professional installation.

43. We expect that a primary use for fixed unlicensed devices in this band would be to provide wireless broadband connectivity by WISPs in rural areas. Therefore, we propose to allow fixed unlicensed devices to operate in the 3650-3700 MHz band with a maximum EIRP of 25 Watts (14 dBW) in order to increase effective range. This EIRP should be beneficial – particularly in rural areas - because, compared to current Part 15 limits, an EIRP of 25 Watts would more than double the signal range of an unlicensed device. We further believe that omnidirectional antennas would typically be employed for this purpose in order to achieve the most uniform coverage of a particular geographic area. To promote flexibility in system design, we propose to permit any combination of transmitter output power/antenna gain, so long as the 25 Watt EIRP limit is not exceeded. Because interference potential is directly related to a device's EIRP, specifying this parameter rather than separate output power and antenna gain limits would more directly reflect the potential for interference in the band.⁶⁸ We seek comment on our proposal to set a maximum EIRP of 25 Watts (14 dBW) for unlicensed RF devices in the 3650-3700 MHz band. Commenters who believe that it would be beneficial to specify other limits, such as transmitter output power and antenna gain, should provide details regarding the benefits or costs of such an approach as compared to our proposal. We also seek comment on our proposed equipment authorization requirements, recognizing the fixed and non-fixed equipment would likely need to be authorized separately because of the different rule requirements.

44. *Antennas.* In ET Docket No. 03-201, we noted that sectorized and phased array antennas could be used to create highly spectrum efficient networks by forming dynamic communication links with mobile or fixed devices in any direction around an antenna structure.⁶⁹ This could enable an application like a broadband local area network to serve a number of spatially separated clients from a single fixed antenna site. Such antennas allow systems to use spectrum more efficiently by making it possible to re-use a given frequency to communicate with different devices along non-overlapping paths. We seek to encourage both new and novel antenna technologies that would foster more intensive spectrum use. Therefore, we do not believe that fixed unlicensed devices should be prohibited from using any particular type of antenna. However, we propose that devices using sectorized, scanning spot-beam, or other antenna types with multiple beam capability be required to limit the EIRP in any direction to no more than 25 Watts. We seek comment on how compliance with this requirement could be determined.

⁶⁷ See, e.g., www.narte.org and www.part-15.org.

⁶⁸ We are considering equipment authorization requirements in another proceeding. See ET Docket No. 03-201, at n. 46 *supra*. Such requirements as might be adopted in that rule making could be applicable to the devices proposed herein.

⁶⁹ See ET Docket No. 03-201 at paragraphs 5-15.

45. *FSS Protection Zones.* FSS earth stations in the 3650-3700 MHz band use high gain antennas that are very susceptible to interference from undesired signals directed toward the main beam. As a result, operation of a fixed unlicensed device located within the earth station's main beam, even with relatively low EIRP, could cause interference at large distances. Conversely, an unlicensed device located outside the earth station's main beam could operate with relatively higher power and at closer separation distances without causing interference.

46. It would be possible, using various propagation models, to develop a continuum of permissible EIRPs as a function of both the unlicensed device's azimuth with respect to the main beam of the FSS earth station, and the separation distance between the two. However, we believe that another approach could provide a greater safeguard for protecting FSS earth stations, while simultaneously reducing and simplifying the burden on professional installers to comply with the standards proposed herein. In short, we propose to define protection zones around each FSS earth station; within which, operation of a fixed unlicensed device would be prohibited. Specifically, we propose that installation of a fixed unlicensed device be prohibited within a plus-or-minus 15 degree arc of any earth station's main antenna beam if the separation distance between the fixed device and the earth station is within 180 km. At azimuths outside this main beam protection arc, a fixed unlicensed device would be prohibited if the separation distance from the earth station is within 25 km. At all other locations outside these zones, we propose that fixed unlicensed devices could be installed and be permitted to transmit with a total maximum EIRP of 25 Watts unless the specifics of such operation would cause harmful interference to FSS earth stations. Based upon standard propagation models, we tentatively conclude that these criteria generally should afford FSS earth stations more than adequate protection from interference. We seek comment on this conclusion and invite comment on whether other distance versus azimuth criteria would be more appropriate.

47. The separation distance proposed for unlicensed fixed operations, i.e., 180 km within 15 degrees of the FSS antenna main-beam azimuth and 25 km otherwise, is a conservative approach derived from the coordination zone that the Commission previously proposed as appropriate for much higher powered licensed fixed operations to protect FSS earth stations in the 3650 MHz band. In the 3650 MHz Second Notice, the Commission tentatively concluded that within 200 kilometers of a FSS site it would be necessary for a licensed fixed operation to coordinate with the FSS operation. Outside of this coordination zone, the licensed operation would not need to coordinate and could operate with up to 1640 Watts EIRP. The 200 kilometer licensed coordination zone was based on line of sight protection to FSS earth stations and took into account elevation angle, and terrain shielding and over the horizon distances from the FSS earth station sites. By way of comparison, the 180 kilometer separation distance, or exclusion zone, we are proposing herein is 20 kilometers less than the 200 kilometer coordination zone proposed for licensed fixed point-to-point stations in the *3650 MHz Service Rules Second Notice*. However, the EIRP of the proposed unlicensed devices will be on the order of 18 dB lower than that proposed earlier for licensed fixed point-to-point facilities. Accordingly, we believe that the reduced separation distance of 180 kilometers within 15 degrees of the main beam is appropriate. Outside of the main beam, the required separation distance (or exclusion zone) of 25 kilometers assumes that a noise-to-interference ratio of 10 dB is acceptable to the FSS operators and that the ITU-R large FSS antenna roll-off gain pattern is appropriate. We believe that these separation distances within which unlicensed fixed devices will not be allowed to operate, in conjunction with the requirement for professional installation will ensure that these fixed devices will not interfere with FSS earth stations. We invite comment on whether the assumptions used are sufficient to provide appropriate protection to the FSS earth stations.

2. Non-Fixed Unlicensed Operation.

48. With respect to non-fixed operation by unlicensed devices, the challenge of protecting FSS is more complex because a non-fixed device would not be limited to a single location, but may move around from one site to another. However, with the approach described below, we believe that the FSS earth stations can be afforded adequate interference protection from non-fixed unlicensed devices.

49. *Power Limits.* As an initial matter, we propose lower power limits for non-fixed unlicensed devices than the limits proposed above for fixed unlicensed devices. We envision that non-fixed devices operating in the 3650 MHz band will be used in similar fashion to non-fixed unlicensed devices used in the 2.4 GHz and 5.8 GHz bands. Operations in the 2.4 GHz band are limited to a maximum power of 1 Watt. Power levels for devices operating in the 5.8 GHz band range from 50 milliwatts (1 Watt EIRP) for devices in the 5.15-5.25 GHz sub-band to 1 Watt (4 Watts EIRP) for devices in the 5.725-5.825 GHz sub-band. In order to protect the FSS and Federal Government operations in the 3650 MHz band, we propose that non-fixed unlicensed devices in the 3650 - 3700 MHz band be limited to a peak EIRP of 1 Watt. We note that handheld unlicensed devices in the 2.4 GHz and 5.8 GHz bands normally operate well below the maximum of 1 Watt due to battery power limitations and human exposure to RF radiation limitations. Therefore, we find that this proposed limit for the 3650 MHz band should allow for most types of unlicensed use while, along with the other limitations discussed below, protect FSS and Federal Government operations. We seek comment on this proposal.

50. *Listen-before-talk, Power Adjustment Capability.* In order to protect FSS earth stations from non-fixed unlicensed devices, we propose that non-fixed devices be required to employ a DFS-like, listen-before-talk mechanism.⁷⁰ In operation, this mechanism would automatically adjust the EIRP of the device based upon the received strength of an FSS uplink signal which is transmitted (in another frequency band) by the same earth station antenna being protected. Detection of a stronger FSS signal by the unlicensed device would indicate relatively closer proximity to an earth station, thus requiring the unlicensed device to operate with lower power; while a weaker received signal would, conversely, indicate that a higher device power could be used. We believe that this approach is desirable in its simplicity because it does not require an unlicensed device to independently determine any other information; such as, the separation from, or its azimuth with respect to the main beam of, an FSS earth station.

51. We tentatively conclude that existing uplink transmissions from FSS earth stations in other bands could be used for this purpose. We reach this conclusion because the FSS stations that we seek to protect - whose operations in the 3650-3700 MHz band are used for downlink purposes - are also used for uplink (earth-to-space transmit) communications in the 5.85-5.925 GHz and 6.425-6.723 GHz bands.⁷¹ Therefore, we propose to require that unlicensed devices be designed with the ability to listen for an FSS uplink signal in these other bands in order to enable automatic EIRP adjustment. We further propose that, if the non-fixed device detects an uplink signal above a minimum power-switching detection threshold of -76 dBm referenced to a 1-megahertz bandwidth (thus indicating close proximity to an earth station), then the non-fixed device would be prohibited from transmitting. For received uplink signals from -76 dBm to -79 dBm, the device would be limited to a maximum EIRP of 250 mW. For received uplink signals between -79 dBm and -82 dBm, the non-fixed device could operate at an EIRP of up to 500 mW. Finally, for received uplink signals at levels of -82 dBm or less, the non-fixed unlicensed devices would be permitted to operate at 1 Watt, provided such operation complies with applicable human exposure limits. We propose to define the power-switching detection threshold as the received signal strength

⁷⁰ DFS refers to dynamic frequency selection. As the literal meaning implies, a DFS signal threshold is often used to trigger a change in operating frequency by a transmitter to avoid causing interference. In this case, however, a signal threshold would be detected in a similar manner to DFS circuitry but used, instead, to adjust the EIRP of the unlicensed device. This approach is similar to that used to protect government radar systems in the 5 GHz band from unlicensed devices. See *Report and Order* in ET Docket No. 03-122, 69 Fed. Reg. 2677 (2004). We note that National Telecommunications and Information Administration (NTIA), FCC, National Aeronautical and Space Administration (NASA) and Department of Defense (DoD), along with input from the industry, worked to develop acceptable sharing conditions between unlicensed devices in the 5 GHz band and the sensitive government installations.

⁷¹ We note that the Commission recently allocated the 5.85-5.925 GHz band for the Dedicated Short Range Communication Service (DSRC). We seek comment what impact the proliferation of DSRC systems could have on this approach.

(RSS) in dBm (or some other metric of received signal format), referenced to the output of a 0 dBi receive antenna. These power limits are captured in proposed §215.252 (c)(2) in Appendix A.

52. The received power levels listed above are based upon a number of technical assumptions including that the maximum allowed EIRP of the unlicensed device would be uniformly spread over a 50 megahertz bandwidth. All of our assumptions are delineated in Appendix C. We seek comment on this approach and invite comment on whether the assumptions used in developing these power levels are appropriate for providing protection to the FSS earth stations. For example, if the maximum allowed EIRP was assumed to be spread over less than a 50 megahertz bandwidth, how would such an assumption affect the tentative results we have obtained? We invite comment on the appropriateness and practicality of implementing this approach for non-fixed unlicensed devices.

53. With respect to the receive bandwidth of the unlicensed device, we believe that no bandwidth correction factor would be required if the receive bandwidth of the non-fixed device is greater than 1 MHz. However, if the RSS is to be measured correctly by a non-fixed device having a receive bandwidth less than 1 MHz, then we propose that a bandwidth correction factor be taken into account. We seek comment on whether $10 \cdot \log(BW/1\text{MHz})$ (where BW is the non-fixed device's bandwidth expressed in megahertz) should be used as the appropriate correction factor for non-fixed devices that have a bandwidth less than 1 MHz. Finally, we seek comment on what equipment authorization procedures should be required to verify compliance with these proposals. This proposal is most easily implemented if satellite uplinks in readily identified bands are operational at times where the FSS earth station is also in receive mode. We recognize that there may be no correlation between the transmit and receive frequencies of the earth stations and that some earth stations may be operating in a receive-only mode. We seek comment on the extent to which this scenario may exist, and possible approaches to apply in those cases.⁷²

54. For systems where multiple devices operate under a central controller, we propose that only the central controller be required to have the capability just described to detect the power-switching threshold and to convey appropriate commands to all devices under its control. We recognize that there may be devices or architectures developed, whereby remote devices are not under the control of a master device. We seek comment on requiring such devices to have power-switching threshold detection capability. We also invite comment on how to identify remote units that operate only under the control of a central controller. If a device is to operate under the control of a central controller we invite comment on the maximum distance the unlicensed device should be allowed to be separated from the central controller and how to ensure that the remote device ceases transmissions when it exceed this maximum distance.

3. Issues Applicable to Fixed and Non-Fixed Operations

55. *Federal Government Facilities.* We seek comment on whether the methods described above for both fixed and non-fixed unlicensed devices would provide an effective means of protecting the three Federal Government radiolocation stations that operate in the 3650-3700 MHz on a primary basis.⁷³ These stations, located at St. Inigoes, MD, Pascagoula, MS, and Pensacola, FL, were grandfathered as a condition of the transfer of the 3650 MHz band to a mixed-use status.⁷⁴ The rules require that FS and FSS

⁷² We note that a search of our FSS licensing database reveals that, as of April 1, 2004, there are 103 earth stations in the 3650 MHz band, and that only three appear to be receive-only operations. The call signs of the three receive-only stations are: E010188, E960105, and WW21.

⁷³ See para. 5, *supra*.

⁷⁴ See letter dated November 2, 1999 from William T. Hatch, Acting Associate Administrator, NTIA to Dale Hatfield, Chief, OET ("*November NTIA letter*"). The coordinates of each site are: St. Inigoes, MD (38° 10' N., 76°, 23' W.); Pascagoula, MS (30° 22' N., 88°, 29' W.); and Pensacola, FL (30° 21' 28" N., 87°, 16' 26" W.).

stations located within 80 kilometers of each site coordinate with the Federal Government, but there is no coordination requirement for unlicensed devices. We observe that an unlicensed device could be designed to listen for transmissions from these facilities and to activate the capabilities of the device to modify its operations as discussed above. Furthermore, as noted above, the adjacent 3600-3650 MHz band is used by high power federal government radar systems that are not limited to the three protected sites. Consequently, unlicensed device manufacturers will likely find the need to incorporate design measures to protect their equipment from possible overload by these adjacent band radar signals.

56. *Operation in Proximity to U.S. Borders.* To provide sufficient protection to Canadian and Mexican stations operating in the 3650-3700 MHz band that are located near the U.S. borders, we propose to require that fixed devices be located at least 8 kilometers from the U.S./Canada or U.S./Mexico border if the antenna of the device looks within the 160° sector away from the border and be located at least 56 kilometers from each border if the device looks within the 200° sector towards the border. This proposal is consistent with the treatment of licensed fixed stations in bands above 470 MHz along the U.S./Canada border.⁷⁵ In addition, we point out that, even under these guidelines, operators of unlicensed devices may need to further reduce their power to protect FSS earth stations in Canada or Mexico. We believe that treating devices along the border in this manner would strike a balance between providing sufficient flexibility for unlicensed operations and the need to protect foreign stations. We seek comment on this proposal. We also invite suggestions for alternative approaches for treating unlicensed devices in the 3650-3700 MHz band along the U.S. borders.

57. We tentatively conclude that no additional requirements are needed for non-fixed unlicensed devices to protect FSS earth stations that may be located in Mexico or Canada. The listen-before-talk, automatic power adjustment mechanism we have proposed for these devices should be sufficient to ensure that no Canadian or Mexican FSS earth stations licensed pursuant to the current regulations will encounter interference. However, we seek comment on whether any special circumstances exist that might require non-fixed devices to incorporate other mechanisms to protect foreign FSS installations.

58. *Removal of Restriction on Unlicensed Operation in the 3650-3700 MHz band.* Unlicensed devices are currently restricted from operating in the 3650-3700 MHz band.⁷⁶ Consequently, unlicensed devices are limited to only spurious emissions in this band.⁷⁷ Historically, restricted bands were established to protect sensitive Federal Government and Non-Federal Government operations, such as radio-astronomy, which rely on reception of extremely weak signals. However, as noted above, the change in the allocation status of the 3650 MHz band from shared to mixed use provides an opportunity to reexamine that prohibition in this band. Because the proposed allocation changes set forth herein would limit licensed use of the 3650-3700 MHz band to relatively few FSS and Federal Government users and because no new Federal Government operations will be assigned in this band, we no longer believe that this band needs to remain restricted. In its comments, SIA states that it is opposed to permitting unlicensed devices to operate in the 3650-3700 MHz band regardless of power level.⁷⁸ It takes this position for several reasons, including lack of technical parameters for unlicensed devices and lack of knowledge of the potential number of unlicensed devices and their geographic orientation to FSS earth

⁷⁵ See U.S. - Canada treaty, "Revised Technical Annex Telecommunication: Coordination and Use of Radio Frequencies Above 30 Megacycles per Second," Signed at Ottawa June 16 and 24, 1965; entered into force June 24, 1965.

⁷⁶ Section 15.205 of the Commission's rules identifies restricted frequency bands in which unlicensed devices are prohibited from operating. See 47 C.F.R. § 15.205.

⁷⁷ See 47 C.F.R. § 2.1. Spurious emission are defined as emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission or information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products.

⁷⁸ See SIA comments at 4.

stations.⁷⁹ We are not persuaded by SIA's argument because, as explained below, we believe that it is feasible to develop operating rules for unlicensed devices in a manner that should address the in-band interference concerns raised by SIA. Accordingly, in order to accommodate new unlicensed use, we propose to revise Section 15.205(a) by removing the restricted designation from the 3650-3700 MHz portion of the currently restricted 3600-4400 MHz band.

59. *Adjacent Band Emissions.* In proposing to remove the restricted status of the 3650-3700 MHz band, we also recognize that it would be adjacent to frequency bands that will continue to be restricted. Therefore, in order to maintain the same degree of protection for adjacent band licensed operations that currently exist under the rules, we propose to require that new unlicensed operations in the 3650 MHz band limit emissions into the adjacent 3600-3650 MHz and 3700-4400 MHz bands to spurious emissions only (*i.e.*, emissions with a maximum field strength of 500 microvolts/meter measured at 3 meters).⁸⁰ A similar situation currently exists in the 2400-2483.5 MHz band which lies between the restricted bands 2310-2390 MHz below and 2483.5-2500 MHz above. Using spectrum-efficient system design and filtering, however, unlicensed devices are nevertheless capable of operating in this band at higher power levels than all other unlicensed devices.⁸¹ In a similar fashion, we believe that transmitters can be designed for the 3650-3700 MHz band with sufficient filtering at the band edges to satisfy the emission limits in our rules. We seek comment on this proposal to limit emissions in the adjacent restricted bands.

60. *Device Identification Signaling.* While we believe that the technical requirements proposed above for fixed and non-fixed unlicensed devices should be more than adequate to avoid interference to FSS earth stations in the first instance, we must also guard against any unforeseen instances when interference might nevertheless occur (e.g., when a new FSS earth station is installed, or when an existing earth station relocates). As an initial matter, we again emphasize that, pursuant to Section 15.5 of the rules, unlicensed devices are required to cease operation if found to be causing interference to any licensed service. In the event that interference might be caused, it could be difficult for the operator of a licensed station to identify and locate an unlicensed device that may be causing interference. Therefore, as a means of facilitating this identification, we propose to require all unlicensed devices to broadcast identification information at regular intervals.

61. At a minimum, the transmitted data should consist of the contact information of the owner/operator of the device. In addition, information about the location of a fixed device could be included. Will this information be useful to FSS licensees? Commenters advocating an identification requirement should also provide detail regarding how often the identification signaling should be done and what other information would be useful. Would information such as the FCC ID number and transmitter serial number be helpful? We also seek comment on the need for, and effective methods to update the contact information when an unlicensed non-fixed device is sold or otherwise transferred to a new owner/operator after the initial sale of the device.

62. We seek to ensure that any identification information embedded within the transmission of an unlicensed device can be easily extracted. Therefore, we seek comment on whether it is necessary to define an identification channel in which to place the data. Initially we propose to require the identification information to be confined to the 1 MHz portion of the band between 3650 MHz – 3651 MHz segment of the band. We note that the proposed band segment for the identification lies adjacent to the newly re-designated 3600-3650 MHz restricted band. We reiterate that only spurious emissions are permitted in the restricted bands. Will unlicensed devices be able to effectively use the 3650-3651 MHz segment for identification purposes without transmitting unauthorized energy into the restricted band?

⁷⁹ *Id.* at 4-7.

⁸⁰ *See* 47 C.F.R. § 15.209(a).

⁸¹ *See* 47 C.F.R. § 15.247.

Alternatively, the identification information can be transmitted as data packets interspersed among the unlicensed device communication data. Will FSS licensees be able to make use of such information and how often should it be transmitted? Regardless of the method used to embed the identification data, we seek comment on whether there is a need to specify a modulation scheme and standardized data format so that the information may be successfully decoded. Finally, we seek comment on whether other possible approaches might be taken to address these issues.

4. Other Methodologies for Protecting FSS Earth Stations.

63. Finally, although we believe that the technical approach described above could be an effective approach for fostering efficient use of the 3650-3700 MHz band by unlicensed devices, we seek comment on two other specific approaches, as well as on other approaches commenters may propose. Either of these approaches could be required, if we ultimately decide that that our proposed approach is not practical, or potentially could be alternatives available to manufacturers of unlicensed devices for protecting FSS earth stations

64. *Geo-location Option.* A first alternative approach for protecting FSS earth stations in the 3650-3700 MHz band would be to use cognitive/smart unlicensed devices that know their current location and the location of nearby earth stations. We sought comment on that approach in the *Unlicensed NOI*, and a number of parties supported that approach. This approach would be based on a determination of reasonable distance separation standards for the operation of low-power non-fixed unlicensed devices in this band. For example, using known protection criteria for an FSS earth station, an unlicensed device could adjust its power based on its location relative to nearby FSS earth stations.

65. This technical approach appears to be feasible. For example, IEEE 802.18 states that embedding GPS in unlicensed devices is technically feasible and could be used to limit the device so that it does not transmit when located in an area where interference to a satellite receive earth station is likely.⁸² We also recently noted that one of the benefits of cognitive radio would be the ability to determine its location and the location of other transmitters, and then select the appropriate operating parameters such as the power and frequency allowed at its location.⁸³

66. One of the requirements of this approach is that we specify distance separations for protecting FSS earth stations. In its comments on the *Unlicensed NOI*, SIA submits a technical annex proposing calculated exclusion zones where unlicensed devices would not be able to operate.⁸⁴ It argues that its analysis indicates a worst case exclusion zone of 416 km is needed for a 1 Watt EIRP unlicensed device to protect a satellite earth station.⁸⁵ We find that SIA's methodology, while clearly deriving distances that would protect FSS earth stations, is overly conservative for the 1-Watt devices we are considering here.⁸⁶ We also believe that the current guidelines in our rules⁸⁷ for identifying when coordination is necessary

⁸² See IEEE 802.18 Comments at 10.

⁸³ See *Cognitive Radio Notice* at ¶¶ 68 - 80.

⁸⁴ *Id.* at 14-21.

⁸⁵ *Id.* at 18. This separation distance is based on the unlicensed device antenna being directly coupled to the receive antenna of the earth station. Other assumptions include a 5 degree elevation angle, free space path loss, an antenna sidelobe pattern based on $32-25*\log_{10}(\theta)$, and an I/N of -10 dB.

⁸⁶ SIA bases its result on free space propagation which is applicable for satellite uplinks and downlinks, but not for terrestrial paths where multipath transmission is likely. In the latter case, free space propagation generally yields an overly conservative minimum separation, as it does not account for environmental effects on or terrain shielding of the RF signal.

⁸⁷ See 47 C.F.R. § 25.251. These guidelines are based on Appendix 7 of the International Telecommunication Union (ITU) Radio Regulations and certain recommendations of the ITU Radiocommunication Sector.

are overly conservative for purposes of this *Notice*.⁸⁸ For instance, in comments filed in the *3650 MHz Service Rules Second Notice*, Comsearch stated that it has been able to coordinate stations at distances much less than otherwise thought necessary, and that in certain cases, earth stations have actually been located near the base of fixed service sites in the same band.⁸⁹

67. We therefore seek comment on alternative methods for determining more accurate minimum separation distances for these low EIRP levels. Under the simplest approach, an unlicensed device need only estimate its distance from the earth station. While overprotecting the earth station when a device is behind the station's main lobe, it still would appear to allow operation over significant geographic areas of the United States. If a device could also estimate its orientation relative to the main lobe of the FSS antenna,⁹⁰ we might reasonably determine lower distance separation requirements when a device is offset from the main lobe, thus granting additional operational flexibility in terms of geographic areas, but at the cost of added complexity. Ultimately, if there are no better methodologies for determining distance separation than those currently in the record, we could permit those approaches even though, compared with our preferred technical method, we believe that they overprotect FSS earth stations and thus needlessly limit the operational flexibility of unlicensed devices in this band.

68. Unlicensed devices would need to protect not only existing FSS earth stations, but also any future earth stations in the 3650-3700 MHz band. Thus, devices relying on geo-location must have a means to identify new FSS earth station locations, which should not occur very frequently. We seek comment regarding methods by which an unlicensed device would access a database of earth station sites and by which an updated database would be maintained.⁹¹ In addition, we seek comment on how often devices would need to update their databases in order to continue to be able to operate, as well as on the type of information that could or should be made available.

69. We also note that it could be possible for an unlicensed device to lose contact with its geo-location reference signals under various circumstances. We seek comment on the protocols that should be followed when an unlicensed device using the geo-location option loses its location detecting capability, such as the period of time that the device could continue to operate before ceasing to transmit. It would appear to make sense to treat an unlicensed device 500 km away from the nearest earth when it lost its geo-location differently from one, for example, only 75 km away.

70. Finally, we seek comment on whether a geo-location approach would be an effective means of protecting the three Federal Government radiolocation stations that operate in the 3659-3700 MHz band on a primary basis, as well as earth stations located in Canada and Mexico. As previously noted, the rules require that FS and FSS stations located within 80 kilometers of each site coordinate with the Federal Government. The locations of Canadian and Mexican earth stations presumably can be made readily available for use with a geo-location approach. Using the techniques described above, it would appear to be possible for unlicensed devices to maintain appropriate separation distances.

71. *Dedicated RF beacon signal.* We also seek comment, although we see various difficulties spelled out below, on whether an unlicensed device could make use of dedicated RF beacon signals

⁸⁸ For example, Appendix 7 software defaults to a minimum distance of 100 km irrespective of the power levels of the devices. Given the limited radio horizon of low-power non-fixed devices we are proposing to allow, Appendix 7 software analysis would not appear to be applicable.

⁸⁹ See Comsearch comments at 3.

⁹⁰ For example, under certain assumptions, the required separation distance for a 1 watt unlicensed device is 168 km when in front and only 25 km when behind, a difference of 143 km.

⁹¹ One method could be for non-fixed unlicensed devices to connect to the internet to receive updated FSS earth station information. Such updates could be done over the air or through a computer with a wired connection (e.g., attaching to a USB port through a cradle as currently done for PDAs and cell phones, etc.)

emanating either directly from an FSS earth station or from another transmitter located in close proximity to an FSS earth station.⁹² Under this approach, unlicensed devices would be designed with cognitive capabilities to detect the absence, presence, or relative strength of the FSS pilot beacon at the location of the unlicensed device and make decisions about whether to transmit or what power levels would be appropriate to protect licensed FSS earth stations. In its simplest form, transmission by the unlicensed device would be enabled at permitted power levels only if no pilot beacon were detected.⁹³ With a more sophisticated capability, an unlicensed device could detect not only the presence of a pilot beacon, but also the relative strength of the received pilot beacon or information in the data stream of the signal about the earth station's receive antenna type and/or orientation. A relatively weak, or absent, beacon signal would indicate that a higher EIRP could be used by the unlicensed device while, conversely, a relatively higher pilot beacon strength would require a corresponding reduction in EIRP.

72. This approach would appear to require adoption of various standardized technical requirements to ensure that unlicensed devices could readily detect a beacon signal. Our analysis does indicate that a separate pilot beacon EIRP of between 1.5 Watts and 26.5 Watts would be sufficient to ensure that non-fixed unlicensed devices would be able to receive the beacon under any foreseeable circumstances where interference to FSS earth station could be a concern. We also think that a standard beacon EIRP might have to be specified, perhaps as well as standard format or information content, so that every earth station would present the same reference beacon signal strength at a given distance. We seek comment on any necessary technical parameters.

73. We also seek comment on the important issue of a standardized frequency or frequencies for such beacon signals. Using a frequency within the 3650-3700 MHz band for a transmission emanating from a location at or close to an FSS earth station raises very significant technical questions about interference to FSS earth stations – especially because this band is in the middle of a broader satellite receive band.⁹⁴ If not a frequency within this band, what other frequencies might potentially be available that could provide the needed functionality without causing interference to existing licensees? If no such frequencies are available, it is not clear how this approach could be implemented.

74. Also, especially compared with the previous two approaches, namely, professional installation of fixed devices and automatic EIRP adjustment for non-fixed unlicensed devices, this methodology also raises questions about the costs and responsibilities for implementation. For example, with respect to responsibility for the operation of a beacon signal, it is not clear how the safeguard could be implemented by unlicensed device operators, so the burden would appear to fall on the FSS earth station licensee. The potentially significant costs raise questions about the equities of imposing them on existing licensees. There are also significant issues regarding whether and how those costs might be paid by unlicensed device operations.

75. To allow FSS earth stations operating in this band, or other entities, to implement a separate beacon, we might need to modify footnote US348 of the Table of Allocations to include a secondary

⁹² Under this approach, a beacon could be an omnidirectional signal or could reproduce the earth station's receive antenna gain pattern.

⁹³ This permissibility of transmission under these circumstances can be inferred from the device's inability to detect the pilot beacon that it is either sufficiently distant - or shielded - from the FSS earth station to avoid causing interference. If a beacon signal were detected, the licensed device could default to operation at the general Part 15 radiated power limit for this band (i.e., 500 μ V/m measured at 3 meters), which should be sufficient to prevent interference. See 47 C.F.R. § 15.209.

⁹⁴ We note that the FSS "extended C-Band" downlink extends from 3600 MHz to 3700 MHz and that a number of satellites use multiple, cross-polarized 72 MHz wide transponders within this frequency band.

radiolocation allocation⁹⁵ for this purpose. We also seek comment on such modification as well as on any necessary modifications to Part 25 of the Commission's rules if we take this approach. Finally, we seek comment on how, under this approach, we should protect the three Federal Government radiolocation stations that operate in the 3650-3700 MHz on a primary basis, as well as earth stations located in Canada or Mexico.

C. Options for Licensed Operations

76. In order to ensure that we can consider all possible approaches for achieving our goals of maximizing efficient use of the 3650 MHz band and the provision of new and advanced service, we are also seeking comment on whether spectrum in this band should be designated for licensed use. If we decide to permit licensed use of the band, we will have to adopt appropriate allocation, technical and operational rules to govern such operations. In the following paragraphs, we shall discuss these requirements. Initially, however, we seek comment on the types of licensed services that might be implemented in the band, what kinds of technologies could be utilized to develop these services, how quickly these services could be developed, and where in the country these services might be implemented. Commenters should also discuss any technical, legal or economic advantages and costs associated with these service options.

77. *Fixed Service and Mobile Service Allocations.* In addition to seeking comment on whether to maintain the band's current primary Fixed and Mobile allocations, we seek comment on whether to remove the mobile station restriction in the current Mobile allocation in this band. Since the Commission adopted the *3650 MHz Allocation Report & Order*, great strides have been made in the development of smart/cognitive radio features that potentially could be used with licensed mobile handset operations to prevent interference with FSS operations.⁹⁶ As a result, we seek comment on whether, if we adopt technical rules requiring use of smart/cognitive features, we should revise the existing Fixed and Mobile allocations to permit mobile stations to operate in the 3650 MHz band.

78. We also seek comment on whether we should modify the FSS allocation if we retain the FS and MS allocations in the band. In the *3650 MHz Allocation Report & Order*, the Commission found that spectrum sharing between licensed terrestrial services and FSS operations on an unrestrained co-primary basis would not be feasible.⁹⁷ As a result, the Commission decided to grandfather existing FSS earth station operations on a primary basis and to allow new FSS earth station operations only on a secondary basis to any FS/MS terrestrial stations. We seek comment on whether the use of smart/cognitive technologies by licensed services would make it technically feasible for new FSS operations to coexist with FS/MS services. Assuming such uses of the spectrum are found to be technically feasible, we request comment on whether FSS could be co-primary with FS/MS and, if so, how this might be accomplished.⁹⁸

79. *Band Segmentation Between Licensed and Unlicensed Use and Band Pairing.* If we adopt an option that permits terrestrial licensed operations, one way of allowing licensed fixed and mobile services, higher-powered unlicensed devices, and FSS earth stations to each have access to the 3650 MHz band would be to segment the band. For example, one segmentation option could be to divide the band into two 15-megahertz segments and a 20-megahertz segment. The two 15- megahertz segments could be

⁹⁵ Radiolocation is a form of radiodetermination, whereby the position, velocity or other characteristics of an object, or the obtaining of information relating to these parameters, is determined by means of the propagation properties of radio waves. 47 C.F.R. § 2.1.

⁹⁶ See *Cognitive Radio Notice supra*.

⁹⁷ See *3650 MHz Band Allocation Order*, 15 FCC Rcd at 20497 ¶ 18.

⁹⁸ For example, if we were to license FS/MS on a geographic basis, what procedures could be used to assure protection of a new co-primary FSS earth station from FS infrastructure and from MS infrastructure and devices?

located at the bottom and the top of the band (*i.e.*, 3650-3665 MHz and 3685-3700 MHz), with the 20-megahertz segment situated in the middle of the band (*i.e.*, 3665-3685 MHz). Under this option, higher-powered unlicensed operations would be restricted to the two 15- megahertz segments and fixed and mobile licensed operations to the 20-megahertz segment, and FSS earth station operations would have access to the entire band on a co-primary or secondary basis with licensed fixed and mobile operations. Licensed fixed and mobile operations would only have to coordinate with FSS earth stations operating on co-channel spectrum, and, because unlicensed devices operate on a non-interference basis, any FSS earth station would be protected from interference potentially caused by unlicensed devices.

80. We seek comment on this segmentation option, as well as splits between unlicensed and licensed terrestrial users in other proportions. Another option, for instance, would be to establish a paired 20 megahertz allocation of 3650–3660 MHz and 3690–3700 MHz for licensed terrestrial services while retaining 30 megahertz in the 3660–3690 MHz portion of the band for unlicensed operation. In addressing different band segmentation scenarios, commenters should discuss whether such scenarios would provide sufficient bandwidth to enable broadband voice or data services – on both the licensed and unlicensed segments. Commenters should also discuss the types of licensed services that might be provided if the licensed spectrum in the band is unpaired, *e.g.*, TDD operations, and the amount of spectrum needed for such services.

81. Alternatively, we seek comment on whether spectrum at 3650-3700 MHz that is made available for licensed terrestrial operations could be paired with spectrum in other frequency bands, *e.g.*, in the 2 GHz to 4 GHz range, and if so, what kinds of services could be provided under this type of licensing scenario. We invite commenters to suggest possible band pairing options. Commenters should address whether, if the frequency bands suggested are relatively far from the 3650-3700 MHz band, it would be technically feasible to produce equipment (*e.g.*, handsets) that could operate on both spectrum bands.

82. *Power Limits.* If, under a licensing approach, we remove the current allocation restriction on the use of licensed mobile devices in the 3650 MHz band (*i.e.*, base station only), licensed and unlicensed operations in the band could take on similar operational characteristics. We thus could require that licensed devices operating in the 3650 MHz band employ the same power limits as proposed above for unlicensed devices. Specifically, we could require that licensed non-fixed devices operate at a maximum power level of 1 watt EIRP, and that licensed fixed devices operate at a maximum power level of 25 watts EIRP. By adopting the same power limit for licensed devices as proposed for unlicensed devices, we should not introduce any interference conditions, with respect to FSS operations, that would not be caused by unlicensed devices alone.

83. We also seek comment on allowing higher power limits for licensed fixed stations operating in 3650 MHz band to enable greater coverage areas and transmission distances for such stations. Along with greater power levels, of course, comes the concern about increased potential interference to FSS earth stations operating both within and above the 3650-3700 MHz band. However, as discussed in the *3650 MHz Service Rules Second Notice*, we could adopt coordination zones surrounding co-channel FSS stations, within which any terrestrial station operator would have to coordinate with the FSS licensee. Because the size of a coordination zone would be a function of the power level of the fixed station, protection of co-channel FSS stations by high-powered licensed fixed stations would be accomplished simply by requiring larger coordination zones for such stations. In the *3650 MHz Service Rules Second Notice*, the Commission proposed a 1000-Watt EIRP limit for base and fixed stations. Such a power limit would create relatively large coordination zones, but would provide greater flexibility for licensees operating in the band. We therefore seek comment on the appropriate EIRP limit – *e.g.*, 25 Watts, 1000 Watts – for licensed base and fixed stations operating in the 3650-3700 MHz band.

84. *Adjacent Band Emissions.* If we decide to permit licensed systems to operate in the 3650 MHz band, we would also have to decide how such systems would protect services operating in adjacent

bands. In the *3650 MHz Service Rules Second Notice*, we proposed that, in order to protect FSS operations in the 3700-4200 MHz band from interference, terrestrial stations operating in the 3650-3700 MHz band would have to comply with the Part 101 emission limits already in place to protect such FSS systems from licensed fixed stations operating in the 3700-4200 MHz band.⁹⁹ With our proposal herein to provide for unlicensed use of the 3650 MHz band, we seek updated comment on what interference criteria might be used to protect adjacent band services from licensed systems operating in the 3650 MHz band. For example, should we require that licensed non-fixed devices comply with the field strength limit described above for unlicensed devices; should we require that licensed fixed stations comply with a particular field strength limit or satisfy the adjacent band protection criteria proposed in the *3650 MHz Service Rules Second Notice*?

85. *Protection of FSS Operations.* If we ultimately adopt a regulatory approach that permits licensed operations in this band, we believe that it would be appropriate to require that licensed devices employ the same measures to protect FSS operations as proposed above for unlicensed devices. We seek comment on whether these measures (or any of the additional measures proposed above to enable unlicensed devices to protect FSS stations - e.g., the geo-location method, the RF beacon method) could or should be applied to licensed devices as a means of protecting Government radiolocation stations, non-Government FSS stations, and Canadian and Mexican stations operating near U.S. borders, or whether, for any reason, other measures (such as, applying our present interservice coordination rules) might be more appropriate.¹⁰⁰

86. *Geographic Area Licensing.* If we ultimately decide to permit licensed operations in this band, we would need to adopt a licensing approach for such operations. In the *3650 MHz Service Rules Second Notice*, the Commission tentatively concluded to license the 3650 MHz band using geographic area licensing and sought comment on what sized licensing area or areas should be utilized to license this spectrum and whether nationwide licensing would be appropriate.¹⁰¹ Similarly, the Commission sought comment on spectrum block size or sizes and whether the band should be licensed using a 50-megahertz license. The Commission also sought comment on a range of issues concerning possible competitive bidding procedures.¹⁰² We seek updated comment from interested parties in all these areas.

87. We thus ask interested parties to refresh the record on whether we should license this band using geographic licensing, as well as on particular geographic licensing approaches. As opposed to site-by-site licensing, geographic licensing may permit licensees more flexibility to respond to market demand and may result in significant improvements in spectrum utilization.¹⁰³ In particular, geographic licensing allows licensees to coordinate usage across an entire geographic area to maximize the use of spectrum in areas of highest demand. Geographic licenses also provide the flexibility to dynamically adjust spectrum

⁹⁹ See *3650 MHz Service Rules Second Notice*, 15 FCC Rcd at 20533 ¶ 115. See also 47 C.F.R. §101.111.

¹⁰⁰ We have proposed above that the 3650-3651 MHz band be used for transmitting an identification signal, based on the assumption that the entire 3650 MHz band may be used for unlicensed operation. If the band is segmented between licensed and unlicensed operations, we seek comment on where to locate the one megahertz blocks within the licensed and unlicensed portions of the band used for this purpose under our various alternatives. Commenters, in responding to this question, should consider how, in designating such blocks, interference to FSS operations in the 3650-3700 MHz band might be minimized.

¹⁰¹ *3650 MHz Service Rules Second Notice*, 15 FCC Rcd at 20516-19 ¶¶ 64-71.

¹⁰² *Id.* at ¶¶ 120-127.

¹⁰³ See, e.g., Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, PR Docket No. 93-144, *First Report and Order*, *Eighth Report and Order*, and *Second Further Notice of Proposed Rule Making*, 11 FCC Rcd at 1463 (1995) (restructuring licensing framework for 800 MHz Specialized Mobile Radio Service and adopting wide-area licensing). See also Gregory L. Rosston & Jeffrey S. Steinberg, *Using Market-Based Spectrum Policy to Promote the Public Interest*, 50 Fed. Comm. L.J. 87, 94 (1997).

usage depending upon market demands. We note that one option for this band would be one nationwide license. Under this approach, there would only be one fixed and mobile services license available for this band which would give the terrestrial licensee greater flexibility in building-out its services. We seek comment on whether it would be appropriate to have one nationwide fixed and mobile services license for this band. We also seek comment on the competitive bidding procedures that should be used in the event that mutually exclusive applications are accepted, and whether the procedures proposed in the *3650 Service Rules Second Notice* would be appropriate for the services that are contemplated to be introduced in this band.¹⁰⁴

88. *Spectrum Leasing.* Additionally, we seek comment on whether fixed and mobile service licensees in the 3650 MHz band should be able to lease their spectrum through the policies established in the *Secondary Markets Report and Order and Further Notice of Proposed Rulemaking* (*Secondary Markets Report and Order* and *Secondary Markets Further Notice*, respectively).¹⁰⁵ In the *Secondary Markets Report and Order*, we took action to remove regulatory barriers to the development of secondary markets to permit third parties to access spectrum through spectrum leasing arrangements. We adopted new policies and procedures that enable most wireless licensees to lease some or all of their spectrum usage rights to third-party spectrum lessees.¹⁰⁶ Under these rules, the Commission is notified of the spectrum leasing arrangements (either through a spectrum manager lease notification or a *de facto* transfer lease application). We seek comment on whether if we adopt licensing rules for this band, our spectrum leasing adopted in the *Secondary Markets Order* would apply. In addition, the *Secondary Market Further Notice* proposed additional ways to facilitate third party access to spectrum through spectrum leasing arrangements, including further streamlining of the notification requirements, and creating leasing mechanisms to facilitate access by opportunistic devices with cognitive radio capability.¹⁰⁷ We seek comment on whether adoption of some of the proposals in the *Secondary Markets Further Notice*, or other revisions in the spectrum leasing policies would help optimize the use of the 3650 MHz band.

89. *Third-Party Access to Licensed Spectrum Under A “Band Manager” Approach.* We also wish parties to update the record on whether, if we adopt licensing rules for this band, we should allow third parties access to spectrum in the 3650 MHz band through a “band manager” licensing model, either as a complement or alternative to the spectrum leasing approach adopted under the *Secondary Markets Report and Order*. In the *3650 MHz Service Rules Second Notice*, the Commission sought comment on whether the use of band manager licensing would be appropriate for the 3650 MHz band.¹⁰⁸ As envisioned by that Commission, the band manager would be a Commission licensee that could engage in the business of making spectrum available to third-party spectrum users through private, written contracts.¹⁰⁹ The Commission specifically sought comment on whether the fixed and mobile services licensee should have the option of electing to operate as a band manager, a traditional licensee (with the right to enter into spectrum leasing arrangements), or both to the extent they serve to complement each other.¹¹⁰

¹⁰⁴ *3650 Service Rules Second Notice*, at ¶¶ 120-127.

¹⁰⁵ Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Report and Order and Further Notice of Proposed Rulemaking*, WT Docket No. 00-230, FCC 03-113 (rel. Oct. 6, 2003) (*Secondary Markets Report and Order* and *Secondary Markets Further Notice*, respectively).

¹⁰⁶ See generally *id.* The spectrum leasing rules are codified in Part 1 subpart X. 47 C.F.R. Part 1 subpart X.

¹⁰⁷ See *id.* at ¶ 232.

¹⁰⁸ *3650 MHz Service Rules Second Notice*, 15 FCC Rcd at 20522-23 ¶ 81.

¹⁰⁹ See Promoting Efficient Use of Spectrum Through Eliminating Barriers to the Development of Secondary Markets, WT Docket No. 00-230, *Notice of Proposed Rulemaking*, 15 FCC Rcd 24203 at 24209 ¶ 17 (2000) (*Secondary Markets Notice*).

¹¹⁰ See *3650 MHz Service Rules Second Notice*, 15 FCC Rcd at 20522023 ¶81.

90. Under this band manager approach, the fixed and mobile services licensee would essentially act as a “spectrum broker” and as spectrum use coordinator. As a spectrum broker, the licensee would have the ability to lease discrete spectrum usage rights to different third party spectrum users through private, contractual agreements, without having to secure prior approval by the Commission and without having to notify the Commission of every lease. As a spectrum use coordinator, the licensee would have the flexibility to lease and coordinate different spectrum rights, including different power levels and other technical parameters, to various spectrum users. We seek comment on whether a licensing framework utilizing the concept of band manager would optimize use of the 3650 MHz band by providing continued protection for incumbents as well as maximum flexibility for the potential fixed and mobile services licensee and for the creation of new and advanced services.¹¹¹ Under this approach, the licensee, subject to the technical rules that we adopt, would decide how to maximize efficient use of the spectrum and coordination issues would be managed by the licensee through private contracts. In addition, the licensee would be directly responsible to the Commission for preventing harmful interference among the different users in the band, including the FSS licensees, as well as licensees in other bands. We also seek comment on any potential disadvantages of this type of a band manager approach, especially related to the interference risks of any particular features of the spectrum in question.

91. If we choose to allow the fixed and mobile services licensee to act as a band manager, the licensee would be subject to any band manager service rules that we adopt. We seek comment on whether our spectrum management policies would be enhanced by permitting the licensee the flexibility to use its spectrum internally or provide telecommunications services, in addition to leasing it. If we were to permit such flexibility, should we also implement safeguards to ensure that a band manager's core function remains focused on leasing to other, third party spectrum users; and if so, how?¹¹² Also, if the fixed and mobile services licensee chooses to be a band manager, should the licensee have the ability to use the spectrum directly and construct its own facilities? In other words, should we limit the concept of a band manager to non-facilities-based operations so the licensee would only be engaged in the business of leasing spectrum? We also seek comment on whether it is necessary to provide additional safeguards to prevent a band manager from discriminating among spectrum users.

92. We also request comment on the type of information to be included in agreements between a band manager and spectrum users if we adopt band manager licensing. We seek comment on whether the requirements the Commission established for agreements between Guard Band Managers and spectrum users in Part 27 of our rules would be appropriate. For example, under Part 27 of our rules, agreements between the Guard Band Manager and spectrum user(s) in the 700 MHz band must specify in detail the operating parameters of the proposed systems including power, antenna height, frequency(s) of operation, base station locations and area of operations.¹¹³

93. We also seek comment on whether we should require the fixed and mobile services licensee if it choose to be a band manager to file annual reports on its spectrum usage with the Commission.¹¹⁴ We seek comment on whether such agreements should ensure that the licensee is responsible for violations of rules by users of the spectrum assigned to them, and whether the licensee must provide the

¹¹¹ *Id.* at 3.

¹¹² *See, e.g., Guard Band Second Report and Order, supra*, n. 102, (limiting band managers and affiliated entity spectrum use).

¹¹³ *See* 47 C.F.R. Part 27, Subpart G.

¹¹⁴ *See* 47 C.F.R. § 27.607.

Commission with information on users to allow the Commission to limit interference and enforce our rules.¹¹⁵

94. *Site-By-Site Licensing.* If we license fixed and mobile services in the 3650 MHz band, another licensing approach would be to use site-by-site licensing. One advantage to a site-by-site licensing option might be that this licensing scheme allows access to the spectrum and entry into the market at a relatively low upfront cost. Under this licensing scheme, we could employ several methods. One method would be an exclusive use approach. Under this approach the first licensee to acquire a license is guaranteed to have its operations protected from interference from other later in time licensees. However, if the licensee wished to add more sites, it would have to acquire a new license for each additional site. We could also use frequency coordinators similar to those for certain microwave services. Under this approach, a frequency coordinator would decide whether interference will be caused by another entity's facilities being located near an existing licensee's facilities. If the frequency coordinator determines that the second entity's facilities will not cause interference to an existing licensee's operations, then the second entity would be able to acquire a license for its facilities.

95. Another method would be a shared use approach. This approach would utilize a frequency coordinator similar to those for the shared private land mobile radio (PLMR) frequencies to determine where licensees can locate their facilities.¹¹⁶ These coordinators do not seek to achieve interference-free operations. By definition, with a shared use approach, we can have multiple licensees operating on the same frequencies in the same geographic areas without having exclusive spectrum usage rights and interference protections. Coordinators could perform the function, for an applicant, of choosing the best frequency(s) available in the service for which the applicant is applying at a particular site. They can do this by trying to match compatible operations, both in terms of the nature of the operations and the number of base stations and associated mobiles already on frequencies in the area, as well as proposed.

96. *Other Issues.* Finally, we seek comment on any other issues that might arise in the event that fixed and mobile services are allowed in the 3650-3700 MHz band along with unlicensed devices and FSS operations.

IV. CONCLUSION

97. In sum, we seek comment on our proposal to allow unlicensed operations in the 3650-3700 MHz band as well as comment on the specific technical options described above. We request that commenters provide detailed information regarding the potential benefits and problems that might result from the use of these technical options -- either alone, in tandem, or in combination with the other approaches on which we are seeking comment.

V. PROCEDURAL MATTERS

A. Initial Regulatory Flexibility Analysis

98. As required by the Regulatory Flexibility Act, *see* 5 U.S.C. § 603, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities of the policies and rules proposed in this document. The IRFA is set forth in Appendix B. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines as comments filed in response to this Notice of Proposed Rule Making as set

¹¹⁵ *See, e.g.*, Implementation of Sections 309(J) and 337 of the Communications Act of 1934 as Amended, WT Docket No. 99-87, *Report and Order and Further Notice of Proposed Rulemaking*, 16 FCC Rcd 6803 (2000) (reviewing some of the considerations that the Commission might take into account in defining a band manager's rights and responsibilities in the context of particular services).

¹¹⁶ *See, e.g.*, 47 C.F.R. Part 90, Subpart H.

forth *infra* in this Section V, and have a separate and distinct heading designating them as responses to the IRFA.

B. Initial Paperwork Reduction Act of 1995 Analysis

99. This NPRM contains either a proposed or modified information collection. As part of its continuing effort to reduce paperwork burdens, we invite the general public and the Office of Management and Budget (OMB) to take this opportunity to comment on the information collections contained in this NPRM, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. Public and agency comments are due at the same time as other comments on this NPRM; OMB comments are due 60 days from date of publication of this NPRM in the Federal Register. Comments should address: (a) whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility; (b) the accuracy of the Commission's burden estimates; (c) ways to enhance the quality, utility, and clarity of the information collected; and (d) ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

C. Ex Parte Rules - - Permit-But-Disclose Proceeding

100. This is a permit-but-disclose notice and comment rule making proceeding. *Ex parte* presentations are permitted, except during the Sunshine Agenda period, provided they are disclosed as provided in the Commission's rules. *See generally* 47 C.F.R. §§ 1.1202, 1.1203, and 1.2306(a).

D. Comments

101. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 C.F.R. §§ 1.415 and 1.419, interested parties may file comments on or before [75 days from date of publication in the Federal Register] and reply comments on or before [105 days from date of publication in the Federal Register]. Comments may be filed using the Commission's Electronic Comment Filing System ("ECFS"), <http://www.fcc.gov/e-file/ecfs.html>, or by filing paper copies. *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 Fed. Reg. 23,121 (1998).

102. Comments filed through the ECFS can be sent as an electronic file via the Internet to <http://www.fcc.gov/e-file/ecfs.html>. Although this proceeding is captioned under multiple dockets, only one copy of an electronic submission, captioned to ET Docket No. 04-151, should be filed. In completing the transmittal screen, commenters should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions for e-mail comments, commenters should send an e-mail to ecfs@fcc.gov, and should include the following words in the body of the message, "get form <your e-mail address.>" A sample form and directions will be sent in reply. Parties who choose to file by paper must file an original and four copies of each filing.

103. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). The Commission's contractor, Natek, Inc., will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, N.E., Suite 110, Washington, D.C. 20002. The filing hours at this location are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building. Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743. U.S. Postal Service first-class mail, Express Mail, and Priority Mail should be addressed to 445 12th Street, SW, Washington, D.C. 20554. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

104. Parties who choose to file by paper should also submit their comments on diskette. Such a submission should be on a 3.5-inch diskette formatted in an IBM compatible format using Microsoft Word or compatible software. The diskette should be accompanied by a cover letter and should be submitted in "read only" mode. The diskette should be clearly labeled with the commenter's name, proceeding (including the lead docket number, type of pleading (comment or reply comment), date of submission, and the name of the electronic file on the diskette. The label should also include the following phrase "Disk Copy – Not an Original." Each diskette should contain only party's pleading, preferably in a single electronic file. In addition, commenters must send diskette copies to the Commission's copy contractor, Qualex International, Portals II, 445 12th Street, SW, Room CY-B402, Washington, DC, 20554.

105. Alternative formats (computer diskette, large print, audio cassette and Braille) are available to persons with disabilities by contacting Brian Millin at (202) 418-7426, TTY (202) 418-2555, or via e-mail to Brian.Millin@fcc.gov. This *Notice* can also be downloaded at <http://www.fcc.gov/oet>.

E. Contact Person

106. For further information concerning this rule making proceeding contact: Neal McNeil at (202) 418-2408, Neal.McNeil@fcc.gov, Gary Thayer at (202) 418-2290, Gary.Thayer@fcc.gov, or Ahmed Lahjouji, (202) 418-2061, Ahmed.Lahjouji@fcc.gov -- Office of Engineering and Technology; or Eli Johnson at (202) 418-1395, Eli.Johnson@fcc.gov, or Marty Liebman at (202) 418-0633, Martin.Liebman@fcc.gov -- Wireless Telecommunications Bureau.

VI. ORDERING CLAUSES

107. Accordingly, IT IS ORDERED that pursuant to the authority contained in Sections 4(i), 302, 303(c), 303(f), and 303(r) of the Communications Act of 1934, as amended, 47 USC Sections 154(i), 302, 303(c), 303(f), and 303(r) this Notice of Proposed Rule Making IS ADOPTED.

108. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this NPRM, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A: Proposed Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 C.F.R. parts 15 and 25 as follows:

PART 15 – RADIO FREQUENCY DEVICES

1. The authority citation of Part 15 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, 304, 307, 336, and 544A.

2. Section 15.205 is proposed to be amended as follows:

§ 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 3650	(²)
13.36 - 13.41		3700 - 4400	

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

* * * * *

3. A new Section 15.252 is proposed to be added to read as follows:

§ 15.252 Operation within the band 3.65-3.70 GHz.

(a) Fixed and non-fixed unlicensed devices in this band must be operated in a manner so as not to cause harmful interference to licensed fixed satellite service (FSS) earth stations authorized to receive signals in the 3650 – 3700 MHz band.

(b) *Fixed devices.* Fixed devices must be installed by a recognized professional installer. The installer shall ensure that the operation of the fixed device is unlikely to cause harmful interference to licensed FSS earth stations and complies with the following requirements.

(1) The maximum peak effective isotropic radiated power (EIRP) shall not exceed 25 Watts. The fixed device may employ an advanced antenna system capable of dynamically modifying the system radiation pattern. The EIRP of the fixed device must be reduced to levels which will not cause interference to existing licensed FSS earth stations.

(2) No fixed unlicensed device shall operate within the sector of a circle around a licensed FSS earth station defined by an arc $\pm 15^\circ$ on either side of the FSS earth station antenna boresight and a 180 km radius. Outside of this sector, no fixed device shall operate within 25 km of a licensed FSS earth station.

(c) *Non-fixed devices.* The maximum peak EIRP of non-fixed devices shall not exceed 1 Watt.

(1) The non-fixed device shall employ active interference avoidance mechanisms to detect FSS earth station uplink signals in the bands 5.85 – 5.925 GHz and 6.425 – 6.723 GHz.

(2) The non-fixed device shall reduce peak EIRP below 1 Watt in accordance with the receive signal level (R_{SS}) as shown below:

Unlicensed Device Receive Signal Strength (R_{SS})	Maximum Allowed EIRP
$R_{SS} > -76$ dBm	(not allowed)
-76 dBm $\geq R_{SS} > -79$ dBm	250 mW
-79 dBm $\geq R_{SS} > -82$ dBm	500 mW
-82 dBm $\geq R_{SS}$	1 Watt

(3) For systems having multiple devices operating under a central controller, only the central controller is required to detect FSS earth station uplink signals. The central controller must instruct all devices under its control to reduce transmit EIRP in accordance with the R_{SS} and paragraph (c)(2) of this section.

(d) No device in this band shall be operated within 80 kilometers of the three authorized Government radiolocation stations unless the methods described above are applied. See § 2.106, Footnote US348, of this chapter.

(e) *Operation in Border areas.* Fixed devices must be located at least 8 kilometers from the U.S./Canada or U.S./Mexico border if the antenna of that device looks within the 160° sector away for the border. The devices must be located at least 56 kilometers from each border if the antenna looks within the 200° sector towards the border.

(f) Within any one second interval of signal transmission, each unlicensed device must transmit a transmitter identification at least once. The identification must be confined to the 3650 – 3651 MHz portion of the band. Each application for equipment authorization must declare that the equipment contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields.

- (1) User/owner contact information.
- (2) Current physical location of the unlicensed device.

The grantee must implement a method that makes it possible for users to specify and update this data.

APPENDIX B: INITIAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹¹⁷ the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this Notice of Proposed Rule Making (NPRM).¹¹⁸ Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the NPRM provided in Part V of the item. The Commission will send a copy of the NPRM, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).¹¹⁹ In addition, the NPRM and IRFA (or summaries thereof) will be published in the Federal Register.¹²⁰

A. Need for, and Objectives of, the Proposed Rules

In broad terms, the central proposal of this Notice would allow unlicensed devices to operate in either all, or portions of, this radiofrequency (RF) band under flexible technical limitations with smart/cognitive features that should prevent interference to licensed satellite services. We also seek comment on whether to restore a uniform primary allocation for all Fixed Satellite Service (FSS) earth stations in the band regardless of the date the earth stations were authorized, and whether to delete the existing co-primary allocations for the Fixed Service (FS) and Mobile Service (MS) in this band. We also seek comment on other options that could also allow for the provision of licensed terrestrial service in this band.

The 3650 – 3700 MHz band is a “transfer” band that the National Telecommunications and Information Administration (NTIA) reallocated from Government/non-Government shared use status to mixed use status effective 1993.¹²¹ Prior to the transfer, the non-government use of the band was limited to international, intercontinental FSS receive stations.¹²² A condition of the transfer allows Government radiolocation stations to continue to operate indefinitely in the 3650 – 3700 MHz band at three locations with a “radius of operation” of 80 kilometers (49.7 miles).¹²³

¹¹⁷ See 5 U.S.C. § 603. The RFA, see 5 U.S.C. § 601 - § 612, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-112, 110 Stat. 847 (1996)(CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

¹¹⁸ We also note that we could certify this action under 5 U.S.C. § 605. See Section E., *infra*.

¹¹⁹ See 5 U.S.C. § 603(a).

¹²⁰ See *id*.

¹²¹ See Spectrum Reallocation Final Report, Response to Title VI – Omnibus Budget Reconciliation Act of 1993, NTIA Special Publication 95-312, released February 1995. Shared use means that a band of frequencies is generally available for both government and non-government use. See 47 C.F.R. § 2.105(b). Mixed use means that government use is limited by geographic area, by time or by other means so as to guarantee that the potential use by government stations is substantially less than the potential use to be made by non-government stations. See Section 113(b)(2)(B) of OBRA-93; 47 U.S.C. § 923(b)(2)(B).

¹²² See *Second Report and Order* in Gen. Docket No. 80-739 (Amendment of Part 2 of the Commission’s Rules Regarding Implementation of the Final Acts of the World Administrative Radio Conference, Geneva, 1979), 49 Fed. Reg. 2357 (January 19, 1984).

¹²³ The three locations are Pascagoula, Mississippi; Pensacola, Florida; and Saint Inigoes, Maryland. Any unlicensed operations in the 3650 -3700 MHz band would be required to protect Federal Government operations at these locations.

In reallocating this spectrum, we sought to maximize the use of the band, and particularly to facilitate the provision of a broad range of traditional voice and broadband high-speed services, and to foster the introduction of such service to rural areas of the country.¹²⁴ We expected this allocation to encourage new and more effective competition to existing wireline local exchange carriers by providing for an economical means to offer competitive “local loop” or “last mile” facilities.

On December 20, 2002, the Commission released a *Notice of Inquiry (NOI)* in ET Docket No. 02-380 seeking comment from the public on the possibility of permitting unlicensed devices to operate in additional frequency bands.¹²⁵ Specifically, the *NOI* sought comment with regard to the feasibility of allowing unlicensed devices to operate in TV broadcast spectrum and the technical requirements that would permit unlicensed devices to operate in that spectrum such that the devices do not cause interference to authorized services. Additionally, the *NOI* sought comment on the feasibility of permitting unlicensed devices to operate in the 3650 – 3700 MHz band at power levels higher than those permitted for unlicensed devices in other bands. Seventy-five parties filed comments and twenty-six parties filed reply comments in response to the *NOI*.

The present proposals, if adopted, will prove beneficial to manufacturers and users of unlicensed technology, including those who provide services to rural communities. Specifically, we note that a growing number of service providers are using unlicensed devices within wireless networks to serve the varied needs of industry, government, and general consumers alike. One of the more interesting developments is the emergence of wireless Internet service providers or “WISPs.” Using unlicensed devices, WISPs around the country are providing an alternative high-speed connection in areas where cable or DSL services have been slow to arrive. We believe that the increased flexibility proposed herein will help to foster a viable last mile solution for delivering Internet services, other data applications, and even video and voice services to underserved, rural, or isolated communities.

B. Legal Basis

The proposed action is authorized under Sections 4(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307.

C. Description and Estimate of the Number of Small Entities To Which the Proposed Rules Will Apply

The RFA directs agencies to provide a description of, and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.¹²⁶ The RFA defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small business concern.”¹²⁷ In addition, the term “small business” has the same

¹²⁴ We also noted and here reiterate our statutory mandate to provide for the deployment of advanced telecommunications services and technologies to all Americans. See Pub. L. 104-104, Title VII, § 706, Feb. 8, 1996, 110 Stat. 153 (Section 706); 47 U.S.C. § 157.

¹²⁵ See *Notice of Inquiry* in ET Docket No. 03-280, 17 FCC Rcd 25632 (2003).

¹²⁶ See U.S.C. § 603(b)(3).

¹²⁷ *Id.* § 601(3).

meaning as the term “small business concern” under the Small Business Act.¹²⁸ Under the Small Business Act, a “small business concern” is one that: (1) is independently owned and operated; (2) is not dominant in its field of operations; and (3) meets may additional criteria established by the Small Business Administration (SBA).¹²⁹ Nationwide, there are a total of 22.4 million small businesses, according to SBA data.¹³⁰

A “small organization” is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”¹³¹ Nationwide, there are approximately 1.6 million small organizations.¹³² The term “small governmental jurisdiction” is defined as “governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”¹³³ As of 1997, there were approximately 87,453 governmental jurisdictions in the United States.¹³⁴ This number includes 39,044 county governments, municipalities, and townships, of which 37,546 (approximately 96.2%) have populations of fewer than 50,000, and of which 1,498 have populations of 50,000 or more. Thus, we estimate the number of small governmental jurisdictions overall to be 84,098 or fewer.

The Commission has not developed a definition of small entities applicable to unlicensed communications devices manufacturers. Therefore, we will utilize the SBA definition applicable to Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing. Examples of products in this category include “transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment”¹³⁵ and may include other devices that transmit and receive IP-enabled services, such as personal digital assistants (PDAs). Under the SBA size standard, firms are considered small if they have 750 or fewer employees.¹³⁶ According to Census Bureau data for 1997, there were 1,215 establishments¹³⁷ in this category

¹²⁸ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

¹²⁹ *Id.* § 632.

¹³⁰ See SBA, Programs and Services, SBA Pamphlet No. CO-0028, at page 40 (July 2002).

¹³¹ See 5 U.S.C. § 601(4).

¹³² Independent Sector, *The New Nonprofit Almanac & Desk Reference* (2002).

¹³³ 5 U.S.C. § 601(5).

¹³⁴ U.S. Census Bureau, *Statistical Abstract of the United States: 2000*, Section 9, pages 299-300, Tables 490 and 492.

¹³⁵ Office of Management and Budget, *North American Industry Classification System*, pages 308-09 (1997) (NAICS code 334220).

¹³⁶ 13 C.F.R. § 121.201, NAICS code 334220.

¹³⁷ The number of “establishments” is a less helpful indicator of small business prevalence in this context than would be the number of “firms” or “companies,” because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census breaks-out data for firms or companies only to give the total number of such entities for 1997, which was 1,089.

that operated for the entire year.¹³⁸ Of those, there were 1,150 that had employment of under 500, and an additional 37 that had employment of 500 to 999. The percentage of wireless equipment manufacturers in this category was approximately 61.35%,¹³⁹ so we estimate that the number of wireless equipment manufacturers with employment of under 500 was actually closer to 706, with an additional 23 establishments having employment of between 500 and 999. Consequently, we estimate that the majority of wireless communications equipment manufacturers are small entities that may be affected by our action.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

Part 15 transmitters are already required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation. *See* 47 C.F.R. §§ 15.101, 15.201, 15.305, and 15.405. The changes proposed in this proceeding would not change any of the current reporting or recordkeeping requirements. Further, the proposed regulations add permissible operating frequencies. The proposals would not require the modification of any existing products.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities. 5 U.S.C § 603.

At this time, the Commission does not believe the proposals contained in this Notice will have a significant economic impact on small entities. The Notice does not propose new device design standards. Instead, it relaxes the rules with respect to the types of devices which are allowed to operate pursuant to the Commission's regulations. There is no burden of compliance with the proposed changes. Manufacturers may continue to produce devices which comply with the former rules and, if desired, design devices to comply with the new regulations. The proposed rules will apply equally to large and small entities. Therefore, there is no inequitable impact on small entities. Finally, this Notice does not recommend a deadline for implementation. We believe that the proposals are relatively simple and do not require a transition period to implement. An entity desiring to take advantage of the relaxed regulations may do so at any time.

Unless our views are altered by comments, we find that the proposed rule changes contained in this Notice will not present a significant economic burden to small entities. We also encourage small entity comment generally on this IRFA, as noted *supra*. Notwithstanding our finding, we request comment on alternatives that might minimize the amount of adverse economic impact, if any, on small entities.

¹³⁸ U.S. Census Bureau, 1997 Economic Census, Industry Series: Manufacturing, "Industry Statistics by Employment Size," Table 4, NAICS code 334220 (issued Aug. 1999).

¹³⁹ *Id.* Table 5.

F. Federal Rules that May Duplicate, Overlap, or Conflict With the Proposed Rule

None.

APPENDIX C
Determination of Detection Threshold for Non-Fixed Device

The parameters assumed for this earth station are summarized below:

Table 1: Earth station parameters

Earth Station	Parameters
Maximum antenna gain (dBi)	55.3
Antenna gain at backlobe (dBi) ¹⁴⁰	-10
Transmit main beam EIRP (dBW/MHz) ¹⁴¹	44
Transmit frequency (MHz) ¹⁴²	5850
Thermal noise temperature. (°K)	100
Assumed receiver bandwidth (MHz)	50
Earth station thermal noise floor ¹⁴³ (dBW/50 MHz)	-131.6
Earth station interference threshold @ $\Delta T/T = 10\%$ ¹⁴⁴ (dBW/50 MHz)	-141.6
Receive frequency (MHz)	3650

The parameters assumed for the non-fixed unlicensed device are summarized in Table 2:

Table 2: Unlicensed device parameters

Unlicensed Device	Parameters
Maximum transmit EIRP when receiving signal at detection threshold (mW)	250
Detection receiver bandwidth (MHz)	1
Antenna Gain (dBi)	0

¹⁴⁰ The antenna sidelobe pattern based on $32-25 \cdot \log_{10}(\theta)$. For $\theta \geq 48^\circ$, antenna gain = -10 dBi.

¹⁴¹ This represents the main beam EIRP density above which 99% of the earth stations in the 5.85-5.925 GHz and 6.425-6.723 GHz bands transmit.

¹⁴² This is used because it is the lowest frequency and thus has the smallest path loss.

¹⁴³ The thermal noise floor is determined using the parameters of noise temperature (t) and receiver bandwidth (b) along with Boltzman's constant (k). Thus, the thermal noise floor is equivalent to ktb , where $k = 1.38 \times 10^{-23}$ j/k

¹⁴⁴ The interference threshold $\Delta T/T$ is a measure of the amount of interference that can be tolerated by the satellite system or earth station. $\Delta T/T$ is related to the increase in system noise temperature and corresponds to the interference-to-noise ratio, I/N. We note that in their comments, SIA assumed a I/N of -10 dB (*i.e.*, $10 \log(\Delta T/T = 0.1 (10\%)) = -10$ dB) (*See* SIA comments at **XX**). Therefore, we used the same value in our analysis. Accordingly, the aggregate interference noise temperature power from all unlicensed devices in the 3650-3700 MHz band must be 10 dB below the corresponding equivalent earth station system noise temperature. Therefore, the interference threshold is calculated at the thermal noise floor (-131.6 dBW) – I/N (10 dB) and is equivalent to -141.6 dBW.

Step 1: Determine the separation distance needed between a 250 mW unlicensed device operating at the backlobe of the FSS station.

Link Budget	Values
Unlicensed device transmit EIRP (250 mW)	24 dBm
Earth station protection threshold (-141.6 dBW/50MHz)	-111.6 dBm/50 MHz
Loss needed between unlicensed device and earth station (24 dBm - -111.6 dBm)	135.6 dB
Miscellaneous losses ¹⁴⁵	10 dB
Loss needed to be attributed to path loss at 3650 MHz (135.6 dB – 10 dB)	125.6 dB
Separation distance at which path loss = 125.6 dB at transmit frequency of 3650 MHz ¹⁴⁶	12.5 Km

Step 2: Determine the detection threshold to protect an FSS earth station from a 250 mW unlicensed device

Link Budget	Values
Earth station main beam transmit EIRP (44 dBW/MHz)	74 dBm/MHz
Earth station antenna gain (backlobe)	-10 dBi
Earth station EIRP (backlobe)	64 dBm/MHz
Free space path loss of satellite signal at 12.5 Km and 5850 MHz	129.7 dB
Miscellaneous losses	10 dB
Total losses	139.7 dB
Received signal at unlicensed device (64 dBm – 139.7 dB)	-75.7 dBm/MHz
Detection threshold to protect earth station	-76 dBm/MHz

¹⁴⁵ These include polarization mismatch, fade, and other miscellaneous losses.

¹⁴⁶ Free space loss assumed where $\text{Loss (dB)} = 32.44 + 20 \cdot \log_{10}(\text{frequency in megahertz}) + 20 \cdot \log_{10}(\text{distance in kilometers})$

**STATEMENT OF
CHAIRMAN MICHAEL K. POWELL**

Re: Unlicensed Operation in the Band 3650-3700 MHz; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band; Amendment of the Commission's Rules with Regard to the 3650-3700 MHz Government Transfer Band, ET Docket Nos. 04-151, 02-380 and 98-237

There has been tremendous progress in the past few years in the development of smart/cognitive radio technologies. This Notice of Proposed Rulemaking takes a hard look at 50 MHz of spectrum in the 3650-3700 MHz band which has the potential to make use of these technologies to promote more efficient use of spectrum and to provide new and advanced telecommunications services and technologies to all Americans. With protected earth stations primarily on the coasts, this band appears particularly promising for extending broadband service in rural areas, such as by wireless internet service providers. Some of these uses could potentially complement unlicensed operations in other bands, such as 2.4 and 5.8 GHz that could allow greater flexibility and continuity in the creation of devices for consumers. This may be another giant step in our effort to bring affordable broadband services to all Americans.

We tentatively conclude that we should allow unlicensed operations with smart radio techniques with fixed satellite services in these bands. To ensure that we have the ability to move forward on whatever approaches will best achieve our goals regarding enhanced services, we welcome consideration of alternative proposals and approaches that could potentially allow the use of both unlicensed and licensed terrestrial services.